EXHIBIT 19

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROSOFT CORPORATION,

Petitioner,

v.

TS-OPTICS CORPORATION,

Patent Owner.

PTAB Case No. IPR2025-00767

Patent No. 7,266,055

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,266,055 B2

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EXHIBIT LIST

Ex. 1001	U.S. Patent No. 7,266,055 B2 to Cho et al. ("'055 patent")
Ex. 1002	Declaration of Masud Mansuripur, Ph.D. ("Mansuripur")
Ex. 1003	Korean Patent Appl. Pub. No. 2001-0038068A to Choi et al. ("Choi")
Ex. 1004	Japanese Patent Appl. Pub. No. H4-113524A to Ogata ("Ogata")
Ex. 1005	U.S. Patent Appl. Pub. No. 2003/0007430 A1 to Ikeda et al. ("Ikeda")
Ex. 1006	Japanese Patent Appl. Pub. No. 11-203697A to Kamata ("Kamata")
Ex. 1007	U.S. Patent No. 6,344,936 B1 to Santo ("Santo")
Ex. 1008	U.S. Patent Appl. Pub. No. 2003/0067848 A1 to Kabasawa et al. ("Kabasawa")
Ex. 1009	Japanese Patent Appl. Pub. No. JP2000123386A to Miura ("Miura")
Ex. 1010	Japanese Patent Appl. Pub. No. JP200118269A to Sugiyama ("Sugiyama")
Ex. 1011	Prosecution File History of '055 Patent
Ex. 1012	U.S. Patent No. 7,817,505 B2
Ex. 1013	U.S. Patent No. 7,065,774 B2
Ex. 1014	U.S. Patent Publication No. 2008/0285423 A1
Ex. 1015	U.S. Patent No. 5,561,648
Ex. 1016	U.S. Patent No. 7,369,335 B2
Ex. 1017	European Patent Application No. EP 1675111 A2
Ex. 1018	CDCaL Median Time-to-Trial Statistics

I. INTRODUCTION

The challenged claims of the '055 patent were already known in the art and would have been obvious to a person of ordinary skill in the art (POSITA).

II. MANDATORY NOTICES

A. Real Parties-in-interest

Pursuant to 35 U.S.C. §312(a)(2) and 37 C.F.R. §42.8(b)(1), the real party in interest in filing this IPR petition is Petitioner Microsoft Corporation. Out of an abundance of caution, Petitioner further identifies Lite-On Technology Corporation as a supplier of an optical drive supplier to Petitioner. Lite-On has not been sued by Patent Owner, however, and accordingly, there would be no time bar even if Lite-On were a real party in interest. *See SharkNinja Operating LLC v. iRobot Corp.*, IPR2020-00734, Paper 11 at 18-20 (PTAB Oct. 6, 2020) (precedential).

B. Related Matters

Patent Owner, TS-Optics Corporation ("TS-Optics," or "PO") asserts that Petitioner infringes the '505 patent in a district court lawsuit captioned *TS-Optics Corp. v. Microsoft Corp.*, No. 8:29-cv-01974-DOC-DFM (C.D. Cal.) (complaint filed Sept. 12, 2024 and served Oct. 1, 2024).

C. Counsel and Service Information

Lead counsel: Babak Tehranchi (Reg. No. 55,937).

Back-up counsel: Patrick J. McKeever (Reg. No. 66,019) and Christina J. McCullough (Reg No. 58,720).

These attorneys can be reached by mail at Perkins Coie LLP, 11452 El Camino Real, Suite 300, San Diego, CA 92130; by phone at (858) 720-5700; and by fax at (858) 720-5799.

Petitioners consent to electronic service. All services and communications to the attorneys listed above may be sent to:

MSFT-TSOptics-IPRService@perkinscoie.com.

A Power of Attorney is being filed concurrently.

III. REQUIREMENTS FOR *INTER PARTES* REVIEW

A. Grounds for Standing

The '055 patent is available for IPR and Petitioner is not barred from requesting IPR.

B. Relief Requested

Claims 1-8, 10-15, 17, 19, 21, 23-24, 26, 28, 36-38, 40-45 are challenged under pre-AIA 35 U.S.C. § 103.

1. Prior art

Petitioner relies upon the references listed in the Exhibit List, including declaration of Prof. Masud Mansuripur, Ph.D. ("Mansuripur" (Ex. 1002), and the following:

Reference	Prior Art Under Pre-AIA 35 U.S.C.	Exhibit
Choi	102(b)	1003
Ogata	102(b)	1004
Ikeda	102(a),(e)	1005
Kamata	102(b)	1006
Santo	102(b)	1007
Kabasawa	102(a),(e)	1008
Miura	102(b)	1009
Sugiyama	102(b)	1010

2. Grounds for challenge under 35 U.S.C. §103

Ground	Reference(s)	Challenged Claims
1	Choi alone or with AAPA	1-4, 7-8, 10-13, 15, 40
2	Choi+Ogata	1-4, 7-8, 10-13, 15, 40, 43-45
3	Choi+Ogata+Santo	41-42
4	Choi+Ikeda	7-8
5	Choi+Ogata+Ikeda	40, 43-45
6	Choi+Ogata+Santo+Ikeda	41-42
7	Ogata+Kamata	36-38
8	Kabasawa alone or with AAPA	17, 21, 23-24, 28
9	Miura (alone or with AAPA) +Kamata	17, 19, 23-24, 26
10	Sugiyama alone or with AAPA	1, 3-4, 10, 12-13
11	Sugiyama (alone or with AAPA)+Kabasawa	5-6, 14

IV. THE '055 PATENT

A. Summary

The '055 patent describes an optical pickup actuator that includes a blade holding an objective lens and supported on a base by a plurality of suspension wires, a magnetic element on the base, and a number of coils. Ex. 1001, Abstract.

Figures 4-7 illustrate the main embodiment and Figure 8 illustrates an alternate embodiment. *Id.*, 5:43-55. The Figure 4 actuator includes a base 100, a blade 110, yokes 171 and 190, and a pair of magnets 180. *Id.*, 6:23-38. The actuator also includes first coil 130 (tilt coils), second coil 140 (tracking coils) and third coil 150 (focusing coils) positioned on the blade. *Id.*, 6:39-40. The third coil 150 may be vertically divided into a plurality of coils. *Id.*, 6:55-57; FIG. 4.

FIG. 4

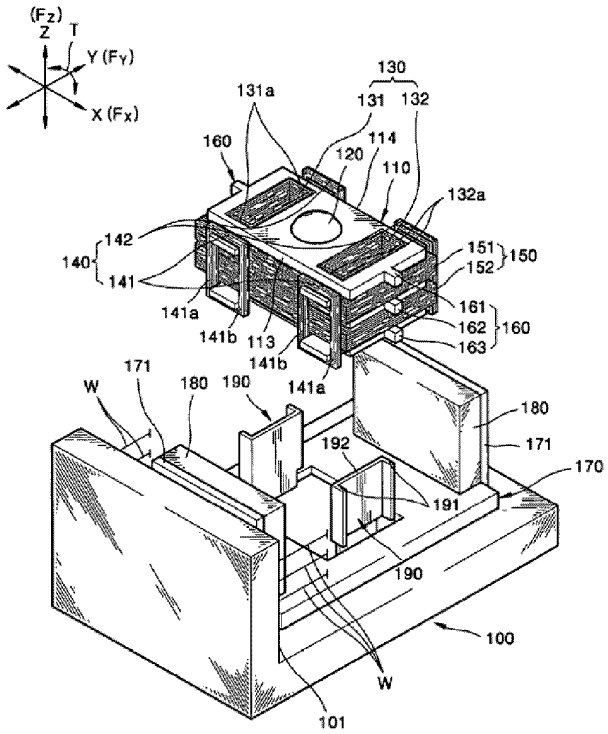
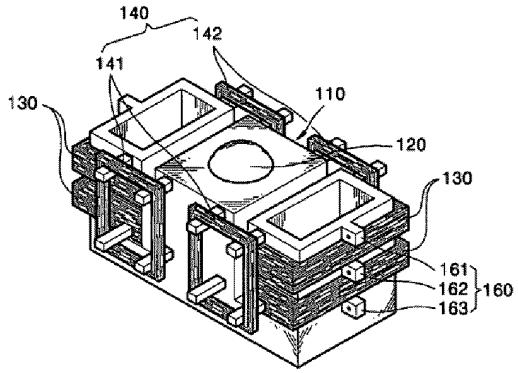


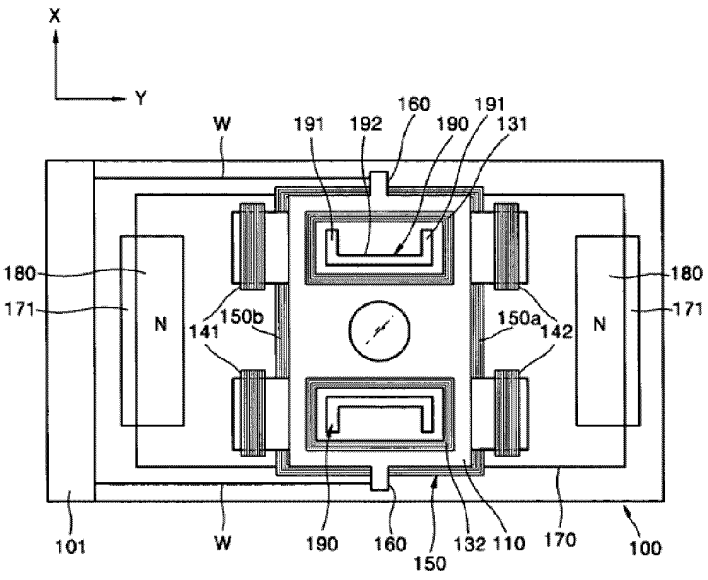
FIG. 8



First coil 130 includes coils 131/132 positioned horizontally on the blade 110 in the X-direction; second coil 140 is disposed on either one or two sides 113/114 in the Y-direction to generate an electromagnetic force in the tracking direction, X, due to interaction with magnets 180. *Id.*, 6:40-52.

A pair of inner yokes 190, positioned on base 100, includes a straight side-wall 192 and a pair of bent sections 191 to improve the sensitivity in tilt and tracking directions. *Id.*, 7:49-54; 7:64-8:54, Fig. 5; Mansuripur ¶¶26-33.

FIG. 5



B. Prosecution History

The '055 patent was filed on May 20, 2004, claiming priority to Korean Patent application dated June 2, 2003. Ex. 1011, 208-285. The first Office Action rejected several claims based on Korean Patent 2002-140828, indicated claims 32-47 were allowed and some dependent claims included allowable subject matter. *Id.*, 167-170. Applicant amended independent claims 1 and 11 with claims 2 and 12 limitations, respectively, and argued against the rejections. *Id.*, 151-163.

A Notice of Allowance was issued on April 27, 2007, which did not specify the reasons for allowance. *Id.*, 142-146. Applicant then filed an information disclosure statement, and subsequently, the patent was issued on September 4, 2007. *Id.*, 23-28, 11. Post issuance, Applicant corrected a typographical error in claim 21 via a certificate of correction. *Id.*, 9-10.

C. Claim Construction

At this time, Petitioner does not believe construction of any term is necessary to resolve the invalidity challenges.

D. Level of Ordinary Skill

As of the alleged June 2, 2003, priority date of the '055 patent, a POSITA would have had a bachelor's degree in mechanical or electrical engineering and two to five years of industry experience in designing optical storage devices, disk drives or in a similar field. A POSITA could substitute additional education for experience, e.g., substituting an advanced degree relating to the mechanical design of storage systems, including optical storage devices and drives, for industry experience in a related field and vice versa. Mansuripur ¶¶16-19.

V. OBVIOUSNESS OF THE CHALLENGED CLAIMS

A. Ground 1: Choi Alone or in view of AAPA Renders Obvious

Claims 1-4, 7-8, 10-13, 15 and 40.

Choi describes an optical pickup assembly that includes a bobbin with an objective lens, focus, tracking and tilt coils, a plurality of magnets and yokes to generate electromagnetic force that drives the objective lens. Choi, Abstract.

Choi's Figure 9 (below, annotated by Petitioner) shows an optical pickup assembly. *Id.*, 47.[1] It includes a base (100), and a bobbin (110) that accommodates an objective lens (111). *Id.*, 51-81, 131-135, 162-171. The assembly also includes a focusing coil (112) and tracking coils (113) that drive the objective lens in the focusing direction (A) and tracking direction (B). *Id.* The base (100) includes a first set of magnets (130) and yoke (131) that interact with the current flowing through focusing (112) and tracking (113) coils. *Id.* Tilt coils (114, 114') drive the objective lens (111) in tilt directions (C, D) via interaction between the current flowing through the tilt coils (114, 114') and a second set of magnets (140, 140'). *Id.*, 142-144, 166-170.

[1] Citations reference line numbers in Choi. A similar convention is used when citing to Ogata, Kamata, Miura and Sugiyama references.

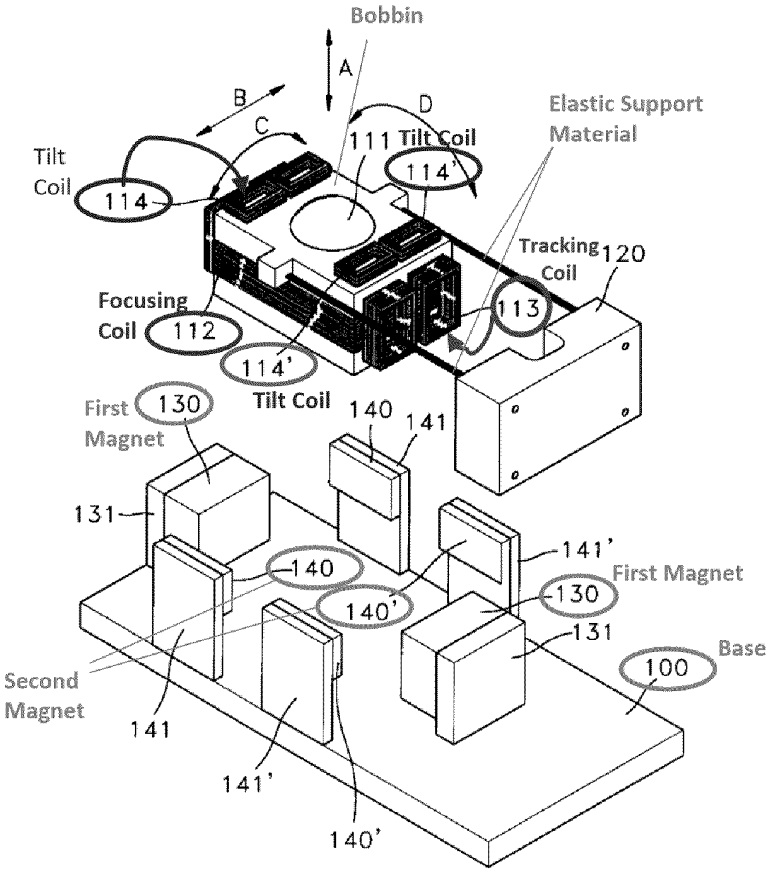


Figure 9 of Choi (annotated)

Choi's objective lens (111) is elastically and movably supported on holder (120) by an elastic support material (121). *Id.,* Abstract, 93-95, 122-127, 182-186; Mansuripur ¶¶43-46.

1. Claim 1

a. 1[pre][2] "An optical pickup actuator for use with an

[2] Claims and associated identifiers (*e.g.*, 1[pre]) are listed in Claims Appendix.

objective lens on a base, comprising:"

Choi discloses an optical pickup assembly (Choi, Abstract), where "an exploded perspective view of ***an optical pickup assembly***"[3] is shown in Figure 9. *Id.*, 47; Fig. 9. Choi's optical pickup assembly includes "a bobbin equipped with ***an objective lens***, an elastic support material to elastically and movably support the bobbin on ***a holder fixed to a predetermined base***." *Id.*, Abstract. The optical pickup assembly in Choi's Figure 9 includes a bobbin (blade) accommodating objective lens (111) on base (100).

[3] Unless otherwise indicated, all bold/italicized emphases are added by Petitioner.

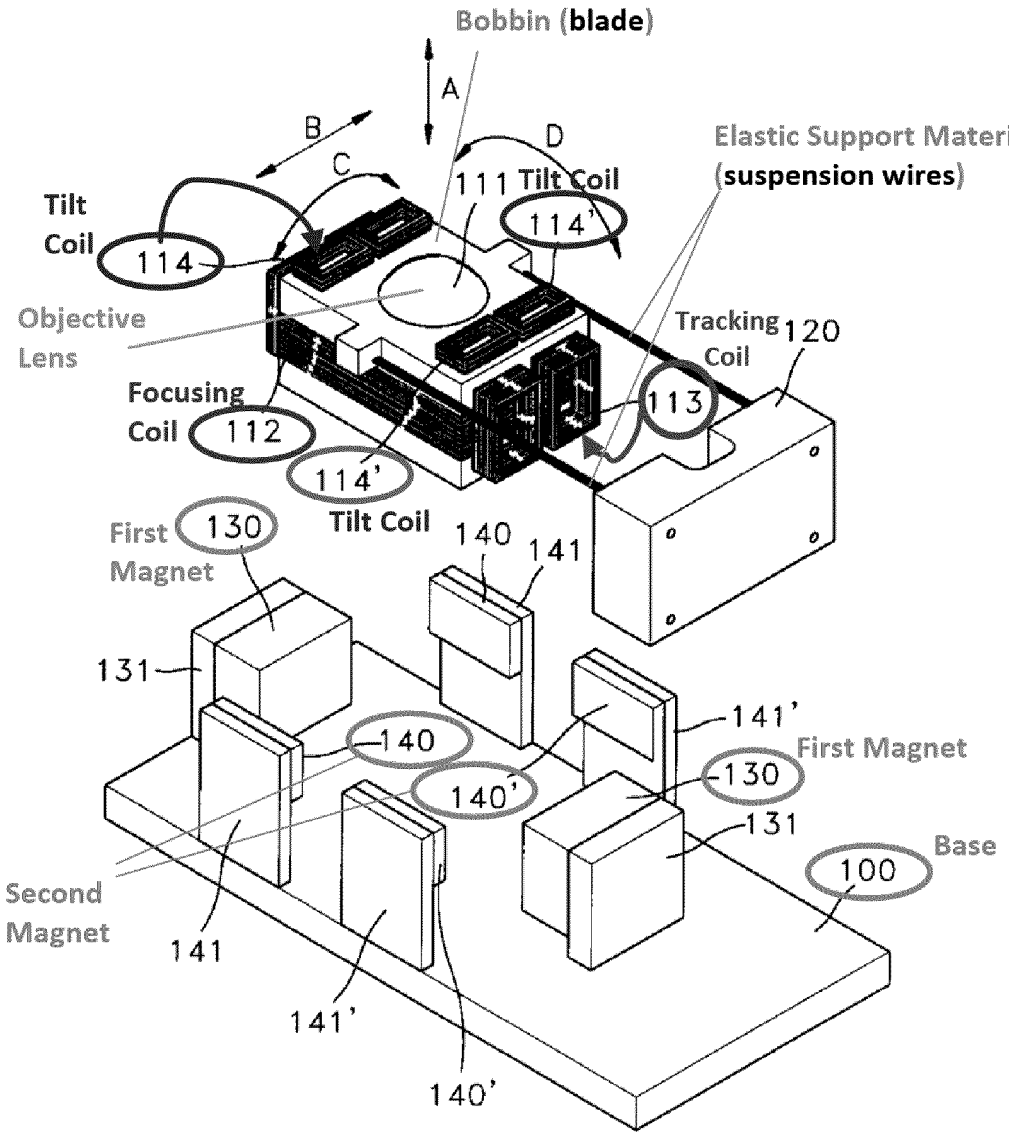


Figure 9 of Choi (annotated)

Choi's pickup assembly includes an optical pickup actuator because it includes a bobbin with associated coils that control the position of the objective lens and move it in focusing (A), tracking (B) and tilting (C, D) directions. *Id.*, 162-170, 131-135. This is consistent with the '055 patent's description that an optical

pickup actuator controls the position of an objective lens in focusing and tracking directions. Ex. 1001, 1:28-35. *See also*, Mansuripur ¶¶47-48.

b. 1[a]: "a blade holding the objective lens;"

Choi discloses a blade (bobbin) holding objective lens (111), as shown in annotated Figure 9 (above). Choi, 131-133, 162-163, 182-186. Choi's bobbin is similar in appearance and functionality to blade 110 in the '055 patent. Ex. 1001, 6:23-24, Fig. 4 (Element 110). It would have been obvious to a POSITA that the terms bobbin (*see, e.g.,* Abstracts in Exhibits 1016, 1017), blade (*see, e.g.,* Abstracts in Exhibits 1012, 1013) and lens holder (*see, e.g.,* Abstracts in Exhibits 1014, 1015) were used interchangeably in the context of optical pickup actuators. Mansuripur, ¶¶49-50.

c. 1[b]: "a plurality of suspension wires supporting the blade on the base so that the blade is elastically movable;"

Choi describes a plurality of suspension wires as two elastic support material (121) that "elastically and movably" support the blade on holder (120) that is fixed to, and installed on, base (100). Choi, Abstract, 77, 132-133. 152-153, Fig. 9 (annotated above), Fig. 11 (Element 121). Additionally, using suspension wires for elastically moving the blade is applicant admitted prior art (AAPA) described in prior art Figures 1 and 2 of the '055 patent. Ex. 1001, 2:39-43; Mansuripur, ¶51.

d. 1[c]: "a magnetic element positioned on the base;"

Choi's optical pickup assembly includes first magnets (130) and second magnets (140, 140'), any one or a combination of which can be construed as claim 1's magnetic element. Choi's magnets are positioned on the base (see Fig. 9, illustrating magnets attached to yokes 131, 141, 141' on base 100) and interact with the current flowing through focusing (112), tracking (113) and tilt (114) coils to move the objective lens in focusing, tracking and tilt directions. Choi, 142-144, 167-171, Fig. 9 (annotated below); *see also*, *id*., 133-144.

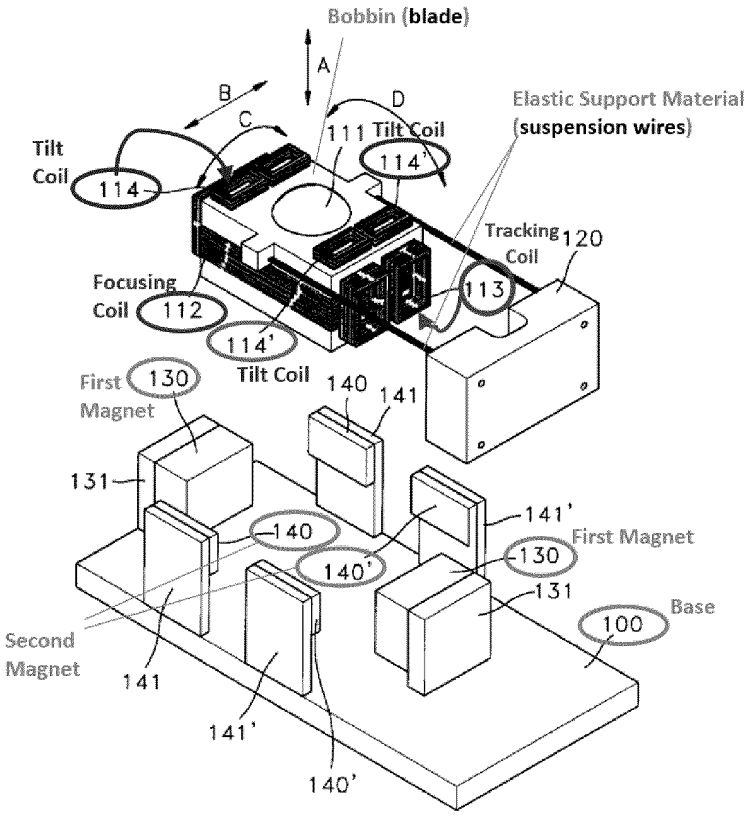


Figure 9 of Choi (annotated)

Interpreting "a magnetic element" to encompass one or more magnetic elements is consistent with the '055 patent's explanation that its pickup assembly includes more than a single magnetic element, namely, "***a pair*** of magnets 180" that interact with focus coil (150) and/or tilt coils (130). Ex. 1001, 6:25-27; Figures 4, 5 and 7. This interpretation is confirmed by dependent claims 7 and 8 that recite "the magnetic element comprises ***a pair*** of unipolar magnets." *Id.*, 11:13-20. *See also*, Mansuripur, ¶¶52-53.

e. 1[d]: "a coil positioned horizontally on the blade to generate an electromagnetic force in a focusing and/or[4] tilting direction through an interaction with the magnetic element;"

Choi discloses this limitation because Choi's focusing coil (112) interacts with first magnets (130) to move the blade in the focusing direction (Choi, 133-135, 162-163) and its four tilt coils (114, 114') interact with second magnets (140, 140') to move the blade in tilt directions. *Id.*, 166-170, Fig. 9 (annotated above).

Choi's focusing and tilt coils are positioned horizontally on the blade because they are positioned on the blade and the direction of their windings is parallel to the top surface of the blade. *Id.*, Fig. 9. This interpretation is consistent with

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[4] The term "and/or" is ambiguous. Nevertheless, Choi renders 1[d] obvious under any interpretation.

the '055 patent, where focusing (150) and tilt coils (130) of Figures 4 and 5 are positioned horizontally on the blade. *See* Ex. 1001, 6:39-41 and 6:55-56; Mansuripur, ¶¶54-56.

Additionally, Choi's focusing and tilts coils singly, or in combination, satisfy the claimed "***a coil***… to generate an electromagnetic force in a focusing and/or tilting direction." Notably, the courts have interpreted that the indefinite article "a" means 'one or more' in open-ended claims with "comprising" as the transitional phrase (like claim 1 here). *See Convolve, Inc. v. Compaq Computer Corp.*, 812 F.3d 1313 (Fed. Cir. 2016) (quoting *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000)). In fact, Element 1[f] (below) recites "***the coil comprises a pair of first coils***," which confirms that the claimed coil can include more than one coil. Mansuripur, ¶57.

f. 1[e]: "wherein the coil is divided into a plurality of subcoils, where each subcoil is separated from an adjacent subcoil in a vertical direction, and;"

Choi describes this limitation because its coil is divided into subcoils (112) and subcoils (114, 114'). See Element 1[d], *supra*. Annotated Figure 9 below shows Choi's tilt subcoil being vertically separated from an adjacent subcoil (i.e., the focusing subcoil). While only one tilt subcoil is annotated, the same vertical separation exists between each tilt subcoil and the focusing subcoil. Similarly, the

focusing subcoil is separated from an adjacent tilt subcoil in the vertical direction, thus rendering this limitation obvious. Mansuripur, ¶58.

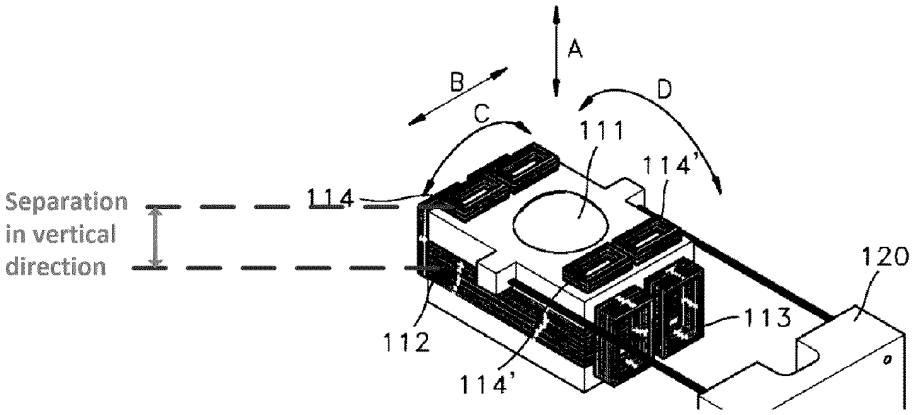


Figure 9 (partial)

g. 1[f]: "wherein the coil comprises a pair of first coils positioned on the blade in a first direction and facing each other with respect to the objective lens."

Choi describes this limitation because its coil includes a pair of tilt coils (114, 114') positioned on the blade, facing each other with respect to objective lens (111). Choi, 164-167. As annotated Figure 9 (below) shows, Choi's pair of tilt coils (114, 114') (a pair of first coils) are on the blade in the E-direction[5] (first direction). Mansuripur, ¶¶59-60.

[5] Petitioner has annotated Figure 9 to designate directions A, B and E. Choi's Figure 9 already includes directions A and B.

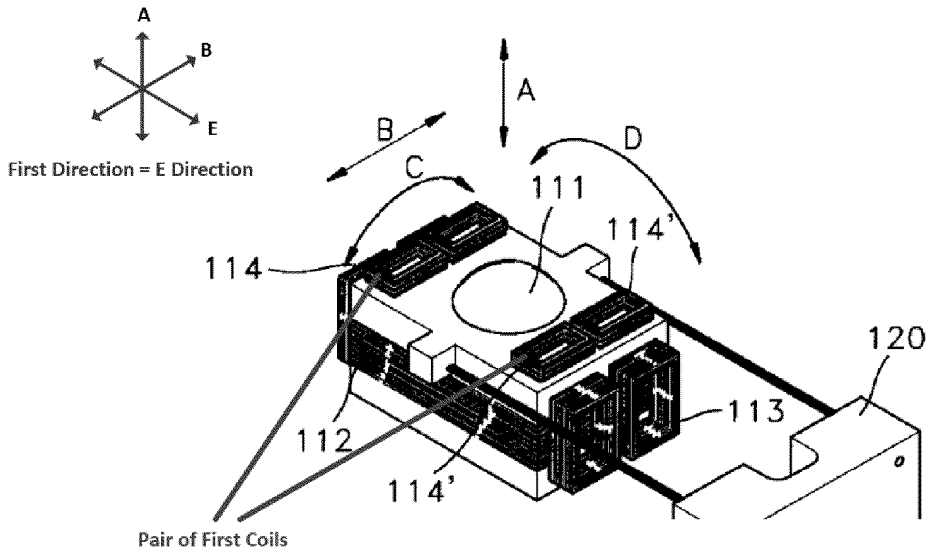


Figure 9 (partial)
(annotated to include coordinate system)

2. Claim 10

a. 10[pre]: "An optical disc drive for a disc that is a recording medium, comprising:"

Choi teaches or suggests the preamble by describing an optical disc drive, including an optical pickup assembly, to record on the optical disc (recording medium): "…***disk players*** that record and play information on disks…are provided with an optical pickup assembly that…***records or reproduces information***." Choi, 91-92; Mansuripur, ¶¶26, 84-85.

b. 10[a]: "a spindle motor for rotating the disc;"

Choi teaches or suggests this limitation because it describes a disk player that plays/records information on an optical disc (Choi, 91-92); a POSITA would have known or found obvious that optical disc drives included a spindle motor to

rotate the disc. Mansuripur, ¶86. A spindle motor in an optical disc drive is also AAPA, as described as part of conventional (prior art) devices in the '055 patent. Ex. 1001, 1:23-27, 3:3-8; Mansuripur, ¶86.

c. 10[b]: "an optical pickup for recording and/or reproducing information by emitting light onto the disc through an objective lens;"

Choi describes "***an optical pickup assembly*** that … ***radiates light to the disk, receives light reflected from the disk***, and records or reproduces information." Choi, 91-92. As explained in Element 1[pre], Choi's pickup assembly accommodates an objective lens for focusing the light onto the disc. *See e.g.*, Choi, Abstract. Therefore, Choi teaches or suggests the claimed optical pick and objective lens similar to the '055 patent's description. See, Ex. 1001, 6:6-11. Additionally, an optical pickup for recording/reproducing information was well-known in the art and is AAPA. *Id.*, 1:20-31; Mansuripur, ¶87.

d. 10[c]: "an optical pickup actuator for controlling a position of the objective lens so that the emitted light is focused on a desired position of the disc, the optical pickup actuator comprising:"

See Element 1[pre]; *see also* Choi, 107-109, 118-119 explaining that its invention strives to ensure light emitted from the objective is provided to the desired location.

e. 10[d]: "a blade holding the objective lens,"

See Element 1[a].

f. 10[e]: "a plurality of suspension wires supporting the blade on a base so that the blade is elastically movable,"

See Element 1[b].

g. 10[f]: "a magnetic element positioned on the base, and,"

See Element 1[c].

h. 10[g]: "a coil positioned horizontally on the blade to generate an electromagnetic force in a focusing direction and/or a tilting direction through interaction with the magnetic element,"

See Element 1[d].

i. 10[h]: "wherein the coil is divided into a plurality of subcoils, where each subcoil is separated from an adjacent subcoil in a vertical direction, and"

See Element 1[e].

j. 10[i]: "wherein the coil comprises a pair of first coils positioned on the blade in a first direction so as to face each other with respect to the objective lens."

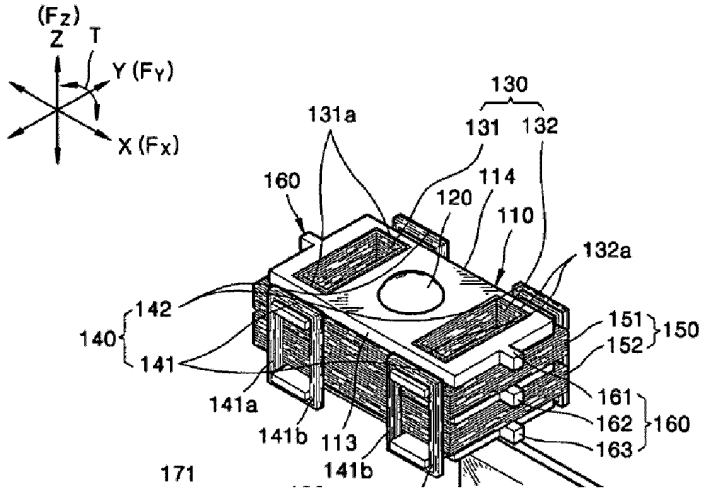
See Element 1[f].

3. Claims 2/11: "…wherein the coil comprises a coil surrounding an outer surface of the blade/…wherein the coil comprises a coil positioned on the blade so as to surround an outer surface of the blade."

Choi's pickup actuator includes a focusing coil (112) wrapping around the side surfaces (outer surface) of the bobbin (blade). Choi, 52, 133-134, 162-163, Fig. 9, Element 112. This is consistent with the '055 patent's explanation that

focusing coil 150 surrounds the outside of the blade. *See* Ex. 1001, 6:55-56; Fig. 4; Mansuripur, ¶61.

FIG. 4



4. Claims 3/12: "…further comprising/comprises a second coil positioned vertically on a side of the blade in a second direction substantially perpendicular to the first direction, the second coil generating an electromagnetic force in a tracking direction through interaction with the magnetic element."

Choi discloses the second coil as tracking coils (113) positioned vertically along the sides of the blade in a second direction (B-direction) that is perpendicular to the first direction (E-direction), as illustrated in Figure 9 (annotated below). Choi's tracking coils (113) include two pairs of subcoils, each pair positioned vertically on one sidewall of the blade; the vertically-placed pair of subcoils (113) are separated in the second (B) direction.

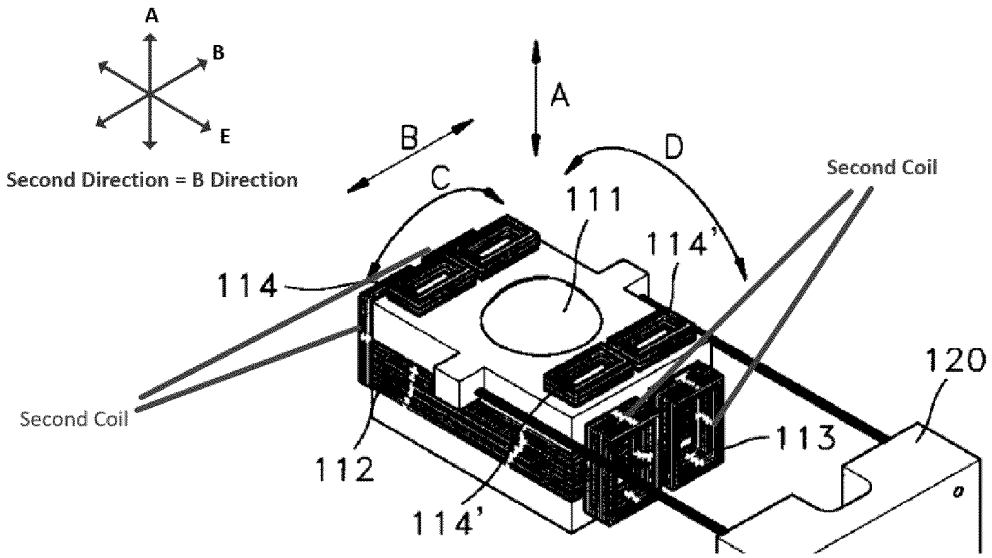


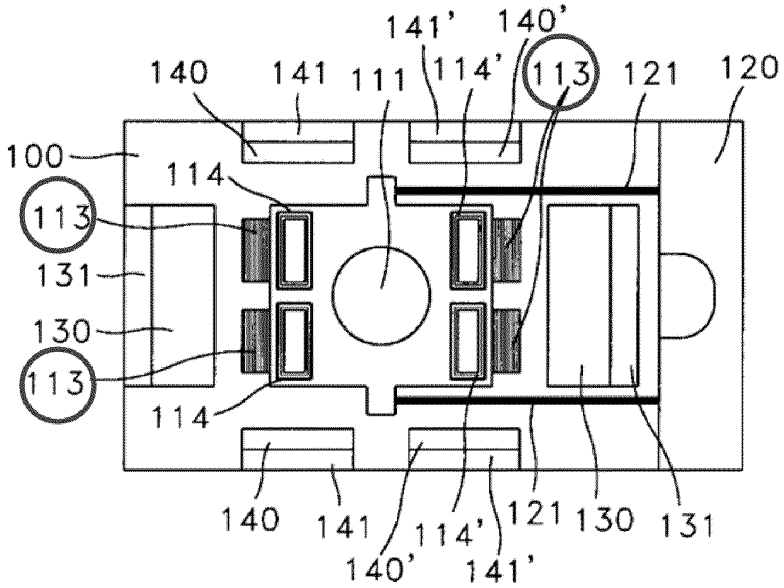
Figure 9 (partial)
(annotated to include coordinate system)

The second coil generating an electromagnetic force in a tracking direction through interaction with the magnetic element: Choi describes "bobbin 110 is equipped with…***a tracking coil 113*** for driving the objective lens 111 in…***tracking direction (B)***; the base 100 is equipped with ***a first magnet 130*** and a first yoke 131 ***for interaction with the current flowing through the coils*** 112 and ***113***." Choi, 132-135, 182-186. Choi further explains such an interaction "generate[s] electromagnetic force that drives the objective lens along with the current flowing through each coil." *Id.*, 124-125. It would have been obvious to a POSITA that Choi's tracking coils generated an electromagnetic force in the tracking direction because, as their name implies, those coils drive the objective lens in the tracking

direction through the interaction with the current flowing through those coils and the magnetic element. Mansuripur, ¶¶63-64.

5. Claims 4/13: "…wherein the second coil is positioned on both sides of the blade."

Choi's tracking coils (113) (second coil) are positioned on both sides of the bobbin (Choi, 131-135), as shown in annotated Figure 9 (above), and annotated Figure 11 (below). Mansuripur, ¶65.



Choi's Figure 11 (annotated)

6. Claim 7: "…wherein the magnetic element comprises a pair of unipolar magnets disposed opposite each other with respect to the blade and have the same polarity."

As Professor Mansuripur explains, all magnets are bipolar, having a north pole and a south pole, and a true unipolar magnet does not exist. Mansuripur, ¶¶66-67. In the optical pickup actuator context, a unipolar magnet refers to using

the magnet such that only one pole–either north or south (but not both)–faces and interacts with a particular coil. This type of unipolar interaction is described in '055 patent's Figure 5 (annotated below), where north pole (N) of magnetic Element 180 is facing, and interacting with, coils 141 and 142. Ex. 1001, 6:19-54.

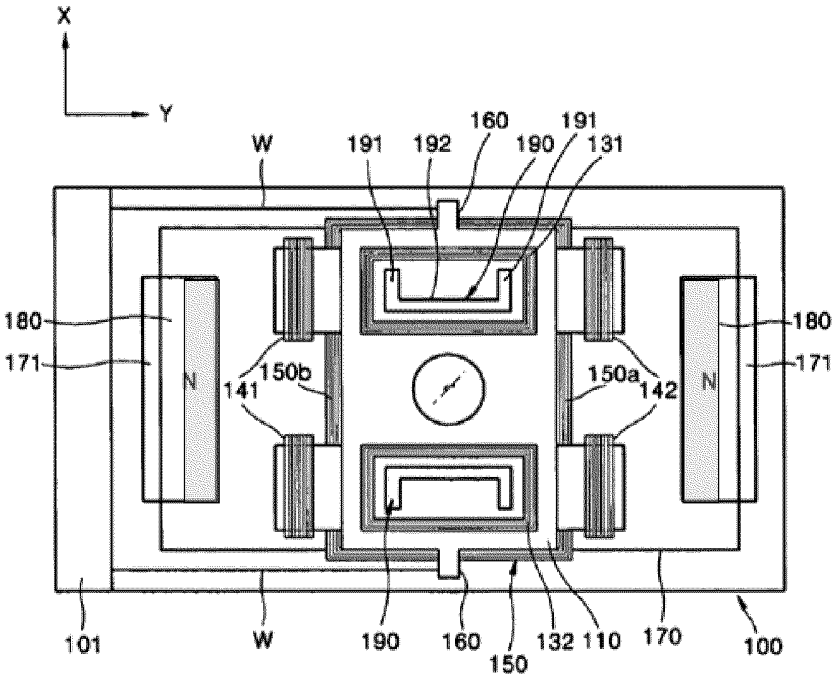


Figure 5 of '055 patent (annotated)

This is also shown in '055 patent's Figure 2 (below), where the north pole of each magnet 22a,b interacts with coils 12a,b. Figure 2 also shows a bipolar interaction where both north and south poles of magnets 21a,b face, and interact with, coils 11a,b.

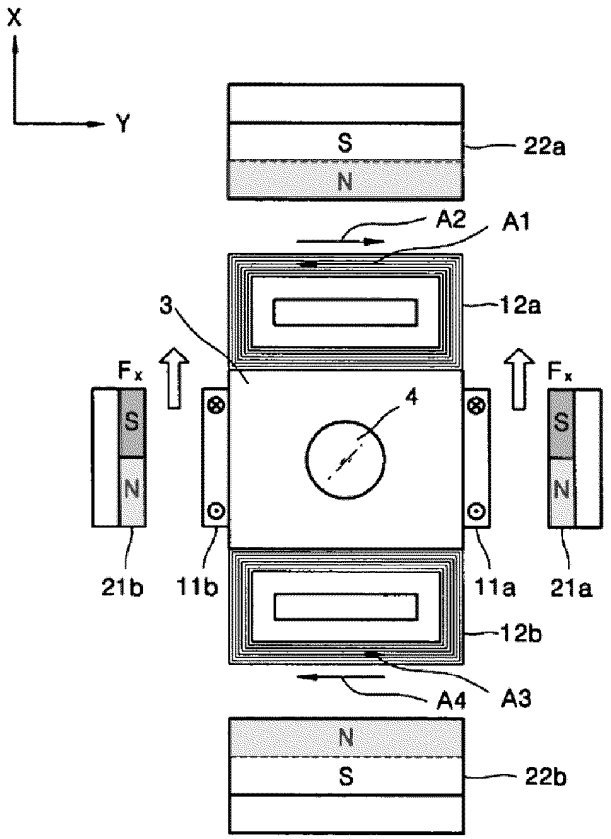


Figure 2 of '055 patent (annotated)

Ex. 1001, 1:36-37, 1:48-52; Mansuripur, ¶¶67-70.

It is inherent and/or obvious that Choi's magnets (130) have unipolar interactions with focusing coil (112). Notably, focusing coil (112) completely wraps around the blade, and when energized, produces an electromagnetic field around the bobbin's periphery that interacts with magnets (130). To move the bobbin in focusing direction (A), both ends of the bobbin must move either up or down, and this is possible only when the same polarity (either both N or both S poles) of magnets (130) faces the coil (112).

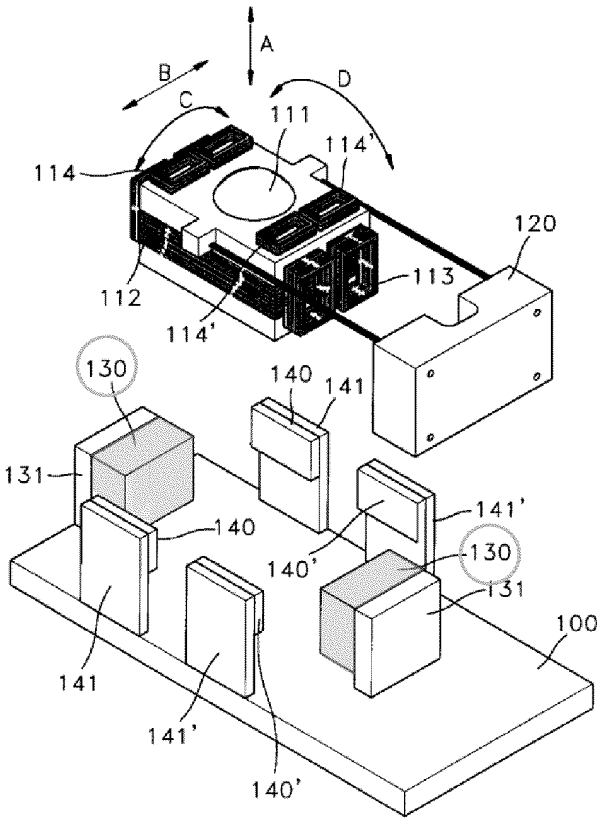
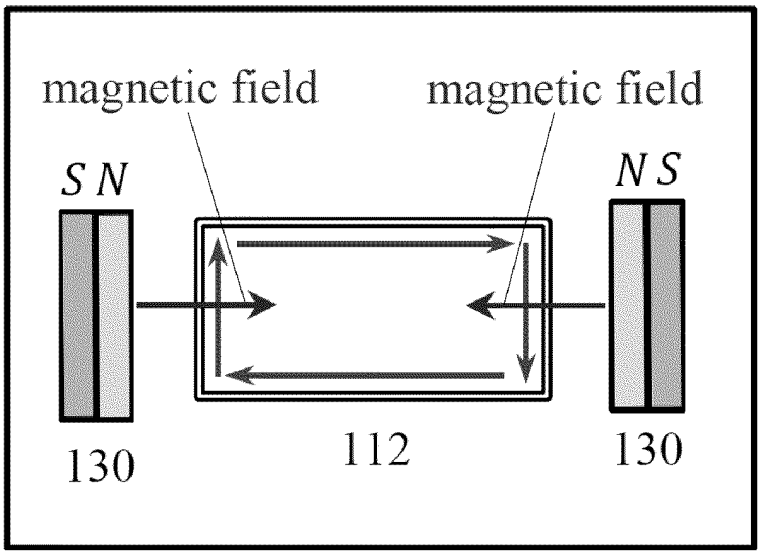


Figure 9
(annotated)

This scenario can be explained using the below diagram, where the north poles of both magnets (130) are facing coil (112) (alternatively, both south poles could be facing the coil), and the current (blue arrows) through the coil (112) is in the clockwise direction. Mansuripur, ¶¶71-77. The two sides of coil (112) facing magnets (130) (the "magnet-adjacent sides") carry their electrical currents in opposite directions relative to each other. The "unipolar" magnets (130) thus exert a Lorentz force on the magnet-adjacent sides of coil (112) in the same direction (either both up or both down)–i.e., along the A-direction depicted in Choi's Figure 9.

Depending on the current's direction (clockwise or counterclockwise), the Lorentz force acting on coil (112) moves the bobbin (110) either up or down, in the focusing direction. This interaction is possible only with "unipolar" magnets. *Id.*



Illustrative Figure – Focus Coil Interaction (Prepared by Petitioner)

7. Claims 8/15: "…wherein the magnetic element comprises a pair of unipolar magnets disposed opposite each other with respect to the blade in the second direction and have the same polarity."

Choi teaches or suggests unipolar interaction between its tilt coils (114, 114') and magnets (140, 140') ("a pair of unipolar magnets") which are disposed in the B-direction (second direction). See annotated Fig. 9 of Choi below. Choi explains: "interaction between the ***current flowing in the tilt coils 114 and 114' and the magnetic force generated by the second magnets 140 and 140'*** and the second yoke 141 and 141' ***causes the tilt operation to be implemented in the directions of arrows C and D.***" Choi, 168-170.

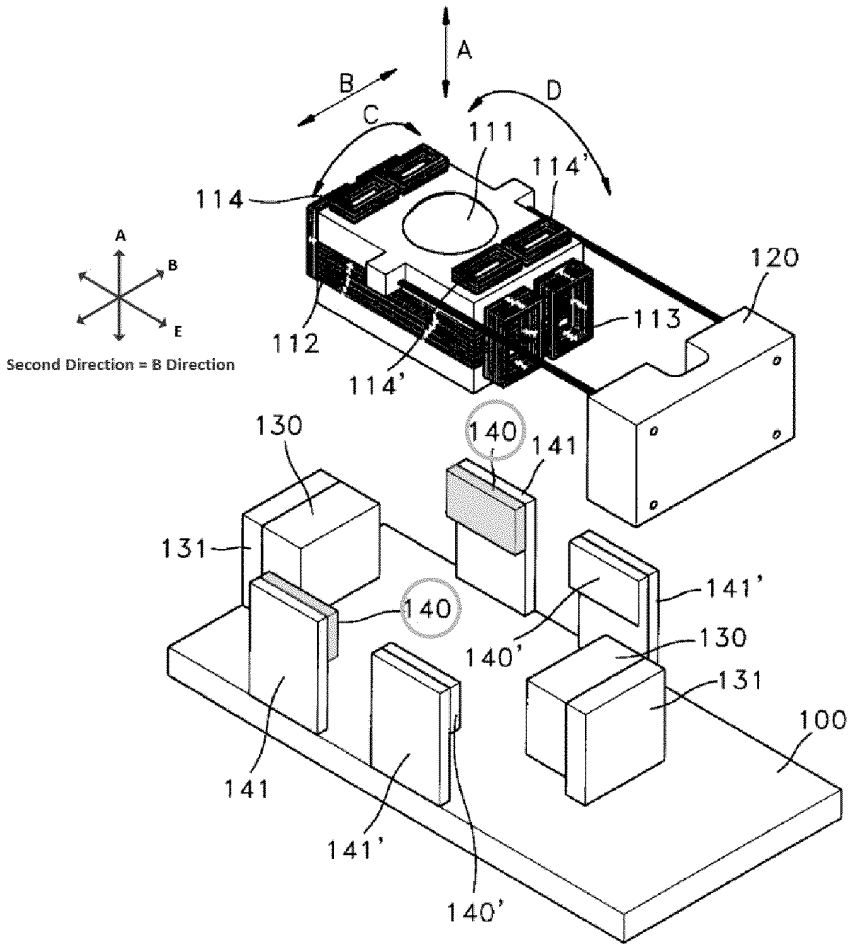
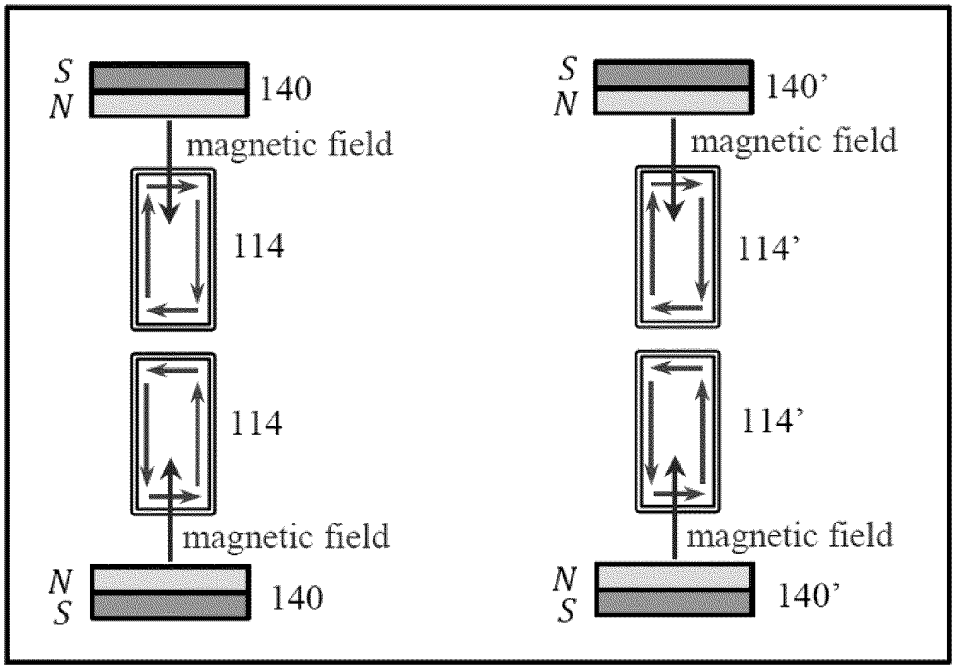


Figure 9 of Choi (annotated)

It is inherent and/or obvious that magnets (140, or 140') positioned in the second (B) direction would be in a unipolar configuration with respect to tilt coils (114/114') because each tilt coil must interact with *a single magnetic pole* of the corresponding magnet to properly move the bobbin in the tilt direction. Otherwise, if the magnets 140/140' were not "unipolar" and each had two poles facing the corresponding tilt coil 114/114', proper tilting would not occur. Mansuripur, ¶¶77-83.

The below figure (prepared by Petitioner) further illustrates the principles behind unipolar interaction, where the pair of magnets (140) acts on coils (114), while the pair of magnets (140') acts on coils (114'). *Id.*



Illustrative Figure – Tilt Coil Interaction (Prepared by Petitioner)

In the illustrated scenario, both magnets (140), placed on opposite sides of bobbin (110) in the second (B) direction, have the same polarity, i.e., north poles facing the coils (alternatively, both south poles could be facing the coils). In the depicted configuration, the electric current (blue arrows) in the two subcoils (114) must be in opposite directions—one clockwise, the other counterclockwise—so that the force of the magnetic field acting on coils (114) would cause them to tilt the bobbin in the tilt direction (C-direction depicted in Choi's Figure 9). A similar

logic applies to magnets (140') and the corresponding tilt coils (114'), as illustrated in the above figure. *Id.*

As Professor Mansuripur further explains, each of the four magnets (140, 140') must have a unipolar interaction with tilt coils (114, 114'), and each of the four magnets 140 and 140' is responsible for generating a Lorentz force via interactions with only a single subcoil of 114 and 114'. Notably, a POSITA implementing the optical pickup assembly of Choi would have had only two obvious choices in selecting the polarity of the pair of unipolar magnets 140 (and 140'): (1) select unipolar magnets with the same polarity facing the tilt coils (as shown in the above illustration), or (2) select unipolar magnets with opposite polarities (one unipolar magnet with its N pole and the other unipolar magnet with its S pole) facing the corresponding tilt coils. In both scenarios, a POSITA would have understood that the desired tilt direction would be achieved by properly selecting the direction of the electrical current (again having only two choices–either clockwise or counterclockwise) driving each tilt subcoil. *Id.*

These constituted only a limited number of choices to enable interactions of the magnetic fields generated by tilt coils (114, 114') and magnets (140, 140') to effectuate tilt control, were well known to a POSITA and were obvious to try. *Id.* Therefore, a POSITA would have found it obvious to select unipolar magnets with

the same poles facing the tilt coils, such as having the magnets' north poles facing the tilt coils, as illustrated above. *Id*.

8. Claim 40:

a. 40[pre]: "An optical pickup actuator for use with an objective lens on a base, comprising:"

See Element 1[pre].

b. 40[a]: "a blade holding the objective lens;"

See Element 1[a].

c. 40[b]: "a plurality of suspension wires movingly supporting the blade on the base;"

See Element 1[b].

d. 40[c]: "a plurality of hinges each of [sic] coupled to an end of a suspension wire;"

Choi describes a plurality of hinges for attaching the elastic support material (121) (suspension wires), as shown in Figure 9 (annotated below). Choi, 77, 132-133; Figures 4 and 9; Mansuripur, ¶102.

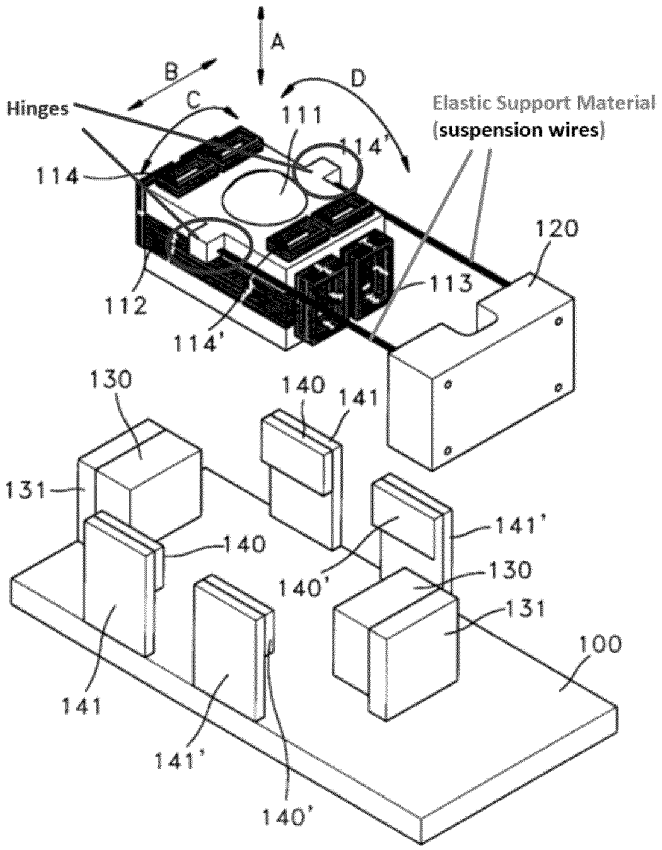


Figure 9 of Choi (annotated)

e. 40[d]: "a pair of unipolar magnets positioned on the base; and"

See claim 8. For Element 40[d] in Ground 1, magnets (140, 140') of Choi are construed as the pair of unipolar magnets positioned on the base.

f. 40[e]: "a plurality of coils connected to an electric circuit and interacting with the unipolar magnets to create an electromagnet force to move the blade; and"

Choi describes a plurality of coils as tilt coils (114), and it would have been obvious to a POSITA that they are connected to an electric circuit because Choi describes driving the coils with an electric current (Choi, 24-30, 182-182); it was

well known and obvious that electric currents are generated by electric circuits. Mansuripur, ¶¶104-105. Choi further explains that the interaction between the current flowing in tilt coils 114/114' and the magnetic force generated by the second magnets 140/140' and the second yoke 141/141' causes the blade to move in the tilt direction. Choi, 167-170; Mansuripur, ¶¶104-105.

g. 40[f]: "wherein at least one of the plurality of coils is divided into subcoils and a hinge coupled to each of the plurality of suspension wires is between an adjacent pair of subcoils."

Choi's tilt coils (114, 114') ("one of the plurality of coils") are divided into subcoils; notably, two tilt subcoils are shown in Choi's Figure 9 (annotated below), each hinge is coupled to a suspension wire and is positioned between two adjacent tilt subcoils (adjacent in E-direction). Mansuripur, ¶106.

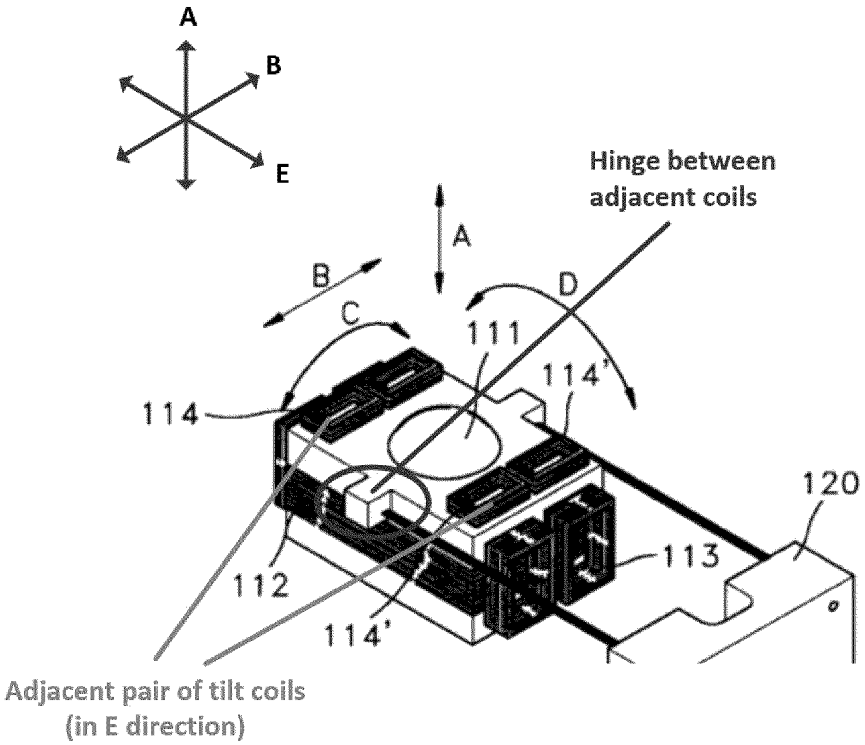


Figure 9 of Choi (partial)
(annotated to include coordinate system)

B. Ground 2: The Choi-Ogata Combination Renders Obvious Claims 1-4, 7-8, 10-13, 15, 40 and 43-45.

Ogata describes a lens drive support that includes "an objective lens holder having an objective lens that focuses a light beam on an optical recording medium, and focus coils that drive the objective lens in the optical axis direction." Ogata, 18-20.

Ogata finds it beneficial to divide the prior art focus coil (60) (of Figure 5) into two subcoils separated in the optical axis (vertical) direction. *Id.*, 21-22, 84-85, Fig. 1 (annotated below).

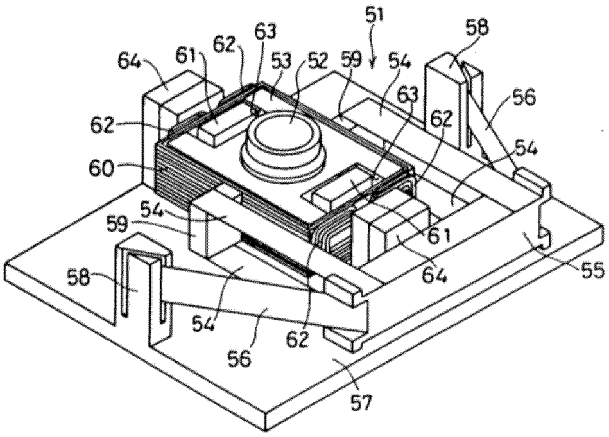


Figure 5 of Ogata (Prior Art)

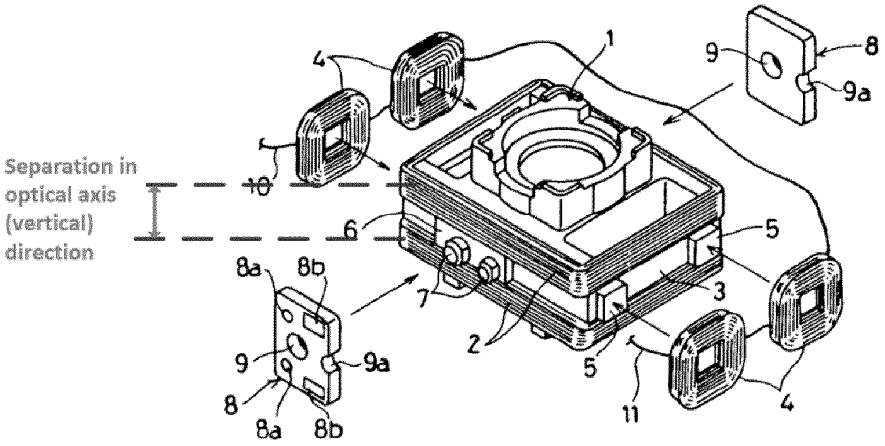


Figure 1 of Ogata (annotated)

Notably, the additional space between the separated focus coils allows placement of radial direction drive coils[6] (4) (tracking coils) onto dowels (5) (*id.*, 26-27, 151-152; Fig. 1) and attachment of leaf springs (12) (elastic members) thereto. *Id.*, 21-22, 66-78, 80-85, 104-108, 134-136, 152-154, 160-161, 170-172; Fig. 4; Mansuripur, ¶¶107-113.

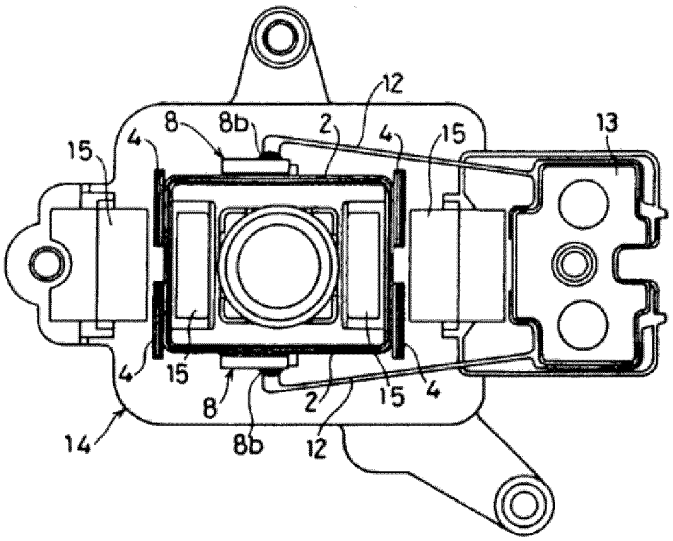


Figure 4 of Ogata

Motivation to Combine: A POSITA would have been motivated to combine the teachings of Ogata with Choi for several reasons. First, both Choi and Ogata related to optical pickup devices that used an objective lens for focusing the

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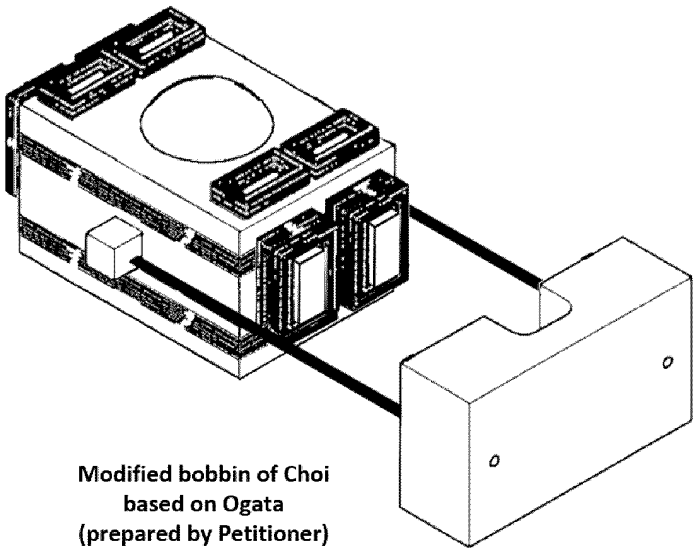
[6] Ogata's radial direction coils are tracking coils, as evident from positioning of those coils and Ogata's explanation that they drive the objective lens perpendicular to the optical axis. Ogata, 25; Mansuripur, ¶112.

light onto an optical disc for reading/recording information (Choi, Abstract, 91-92; Ogata, 29-31, 81-87) and both references sought to improve the operations of optical disc drives. Choi, 117-119; Ogata, 104-108, 187. Thus, a POSITA would have been motivated to improve Choi by incorporating complementary techniques of Ogata with the shared goal of improving its optical disc drive. Mansuripur, ¶¶114-115.

Second, Ogata's new configuration provided dowels in the space between the separated focus subcoils for easy and accurate installation of tracking coils. Ogata, 170-172, 182-185. Therefore, a POSITA would have been motivated to improve Choi's device by modifying its focus coil to allow placement of dowels for easy and accurate installation of tracking coils (113), and to improve the assembly of the device, as Ogata explained. *Id.*, 175-176; Mansuripur, ¶116.

Third, Ogata realized that attaching tracking coils to the surface of the focus coil via an adhesive could produce an unstable bonding strength that changed over time. Ogata, 73-77. Therefore, a POSITA would have found it beneficial to improve Choi's configuration (which placed tracking coils (113) on top of focusing coils (112)–see Choi's Fig. 9) by, instead, using Ogata's dowels for installation of tracking coils to improve the long-term stability and performance of the device, as contemplated by Ogata. *Id.*, 106-108, 176-177; Mansuripur, ¶117.

The Combined System: The combination would include Choi's optical pickup assembly, modified to separate Choi's focus coil (112) into two vertically separated subcoils and to place the hinges in the space therebetween, based on Ogata's teachings. Placing the hinges between the two focus coils would have produced a better balance, flexibility and stability for the optical pickup. *See* Element 40[c], *infra*; Mansuripur, ¶¶118-119, 130-131. Furthermore, Choi's optical pickup assembly would have been modified to include four dowels (similar to Ogata's dowels (5)) to allow improved positioning of Choi's tracking coils (113). An illustration of the modified bobbin of Choi is shown below. *Id*.



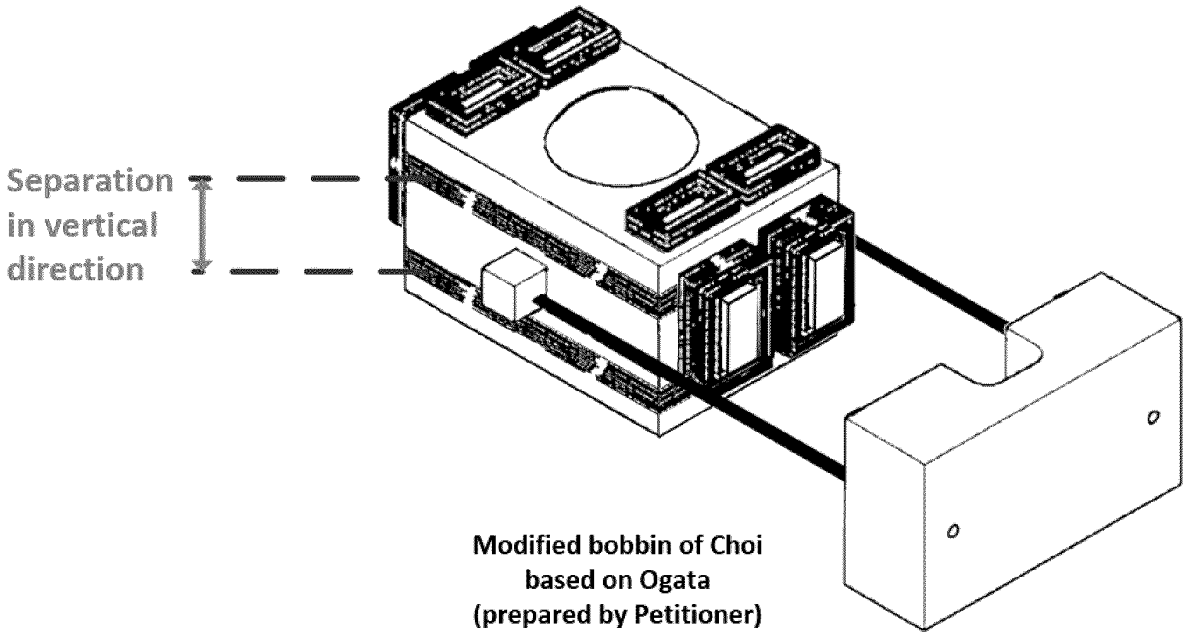
Modified bobbin of Choi based on Ogata (prepared by Petitioner)

Reasonable Expectation of Success: A POSITA would have had a reasonable expectation of success in modifying Choi's optical pickup as explained above because the same modifications were described in Ogata. Ogata, 81-102. Making

the combination involved routine mechanical and electrical modifications that were well within the capabilities of a POSITA. Mansuripur, ¶118.

1. Claims 1 and 10:

Limitations 1[e]/10[h] recite: "…the coil is divided into a plurality of subcoils, where each subcoil is separated from an adjacent subcoil in a vertical direction." The Choi-Ogata combination teaches or suggests this limitation because the focus coil is divided into two vertically separated subcoils, as described above and illustrated in the example figure below.



Modified bobbin of Choi based on Ogata (prepared by Petitioner)

In the Choi-Ogata combination, Choi teaches or suggests the remaining limitations of claims 1 and 10, as described in Ground 1. *See* Sections V.A.1-2, *supra*; Mansuripur, ¶¶120-121.

2. Claims 2-4, 7-8, 11-13 and 15:

Claims 2/11: In the Choi-Ogata combination, the pair of vertically separated focusing coils constitute the coil surrounding an outer surface of the blade, as illustrated in Ogata's Figure 1 (below) and the above figure prepared by Petitioner that illustrates the combination. Mansuripur, ¶122.

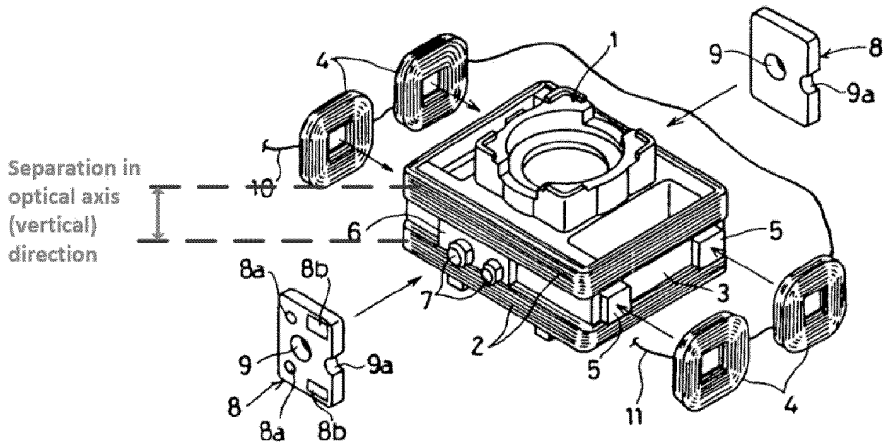


Figure 1 of Ogata (annotated)

Claims 3-4, 7-8, 12-13, 15: In Choi-Ogata combination, Choi teaches or suggests claims 3-4, 7-8, 12-13 and 15, as described in Ground 1. See Sections V.A.4-7, *supra*; Mansuripur, ¶123.

3. Claim 40

In Choi-Ogata combination, Choi and Ogata teach or suggest elements 40[c] and 40[f], while Choi teaches or suggests the remaining elements of claim 40.

a. 40[pre]-40[b]

See Element 1[pre]-1[b], in Ground 1, respectively.

b. 40[c]

Choi describes a plurality of hinges for attaching elastic support material (121) (suspension wires). Choi, 77, 132-133; Fig. 9 (annotated below).

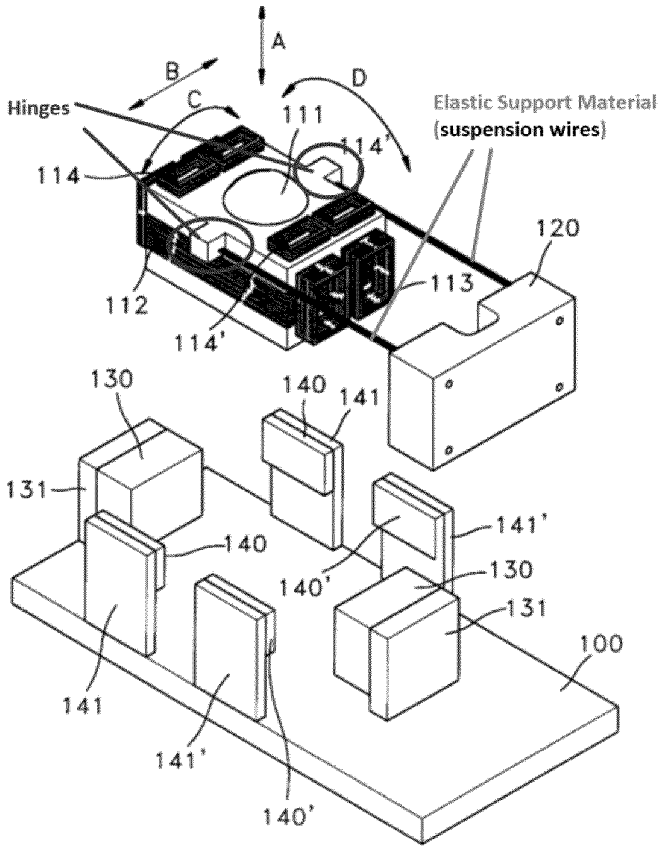
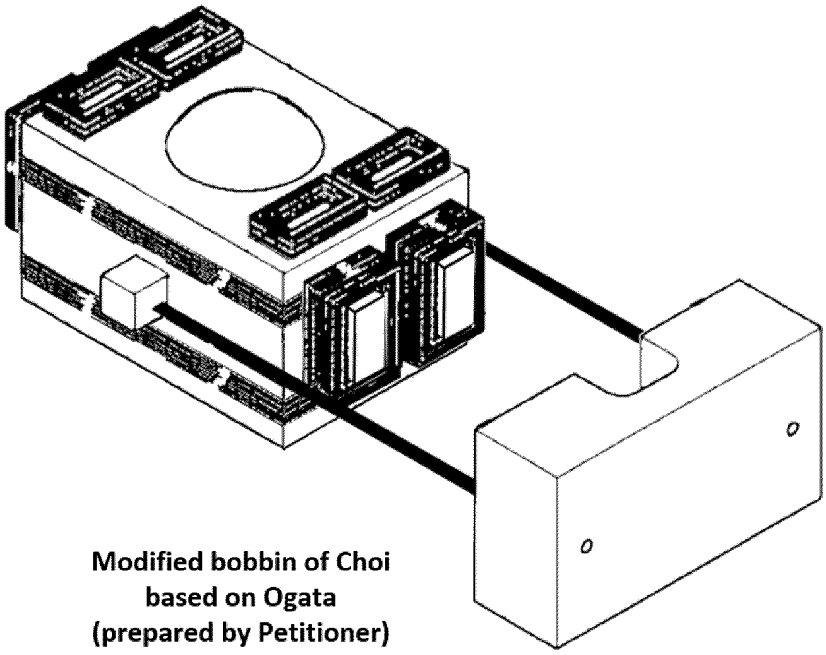


Figure 9 of Choi (annotated)

In the Choi-Ogata combination, the hinges would be moved to the empty space between the two vertically separated focus coils, as shown in the modified figure (below).



Modified bobbin of Choi based on Ogata (prepared by Petitioner)

A POSITA would have found this modification obvious because Ogata shows similarly-situated connection points (8) for attaching leaf springs (12) (suspension wires). Additionally, placement of hinges between the two focus coils would have produced a better balance, flexibility, and stability of the optical pickup. Mansuripur, ¶¶128-131.

c. 40[d]

See claims 7 and 8 in Ground 1. For Element 40[d] in Ground 2, Choi's magnets (130) or magnets (140/140') are construed as the pair of unipolar magnets positioned on the base. Mansuripur, ¶132.

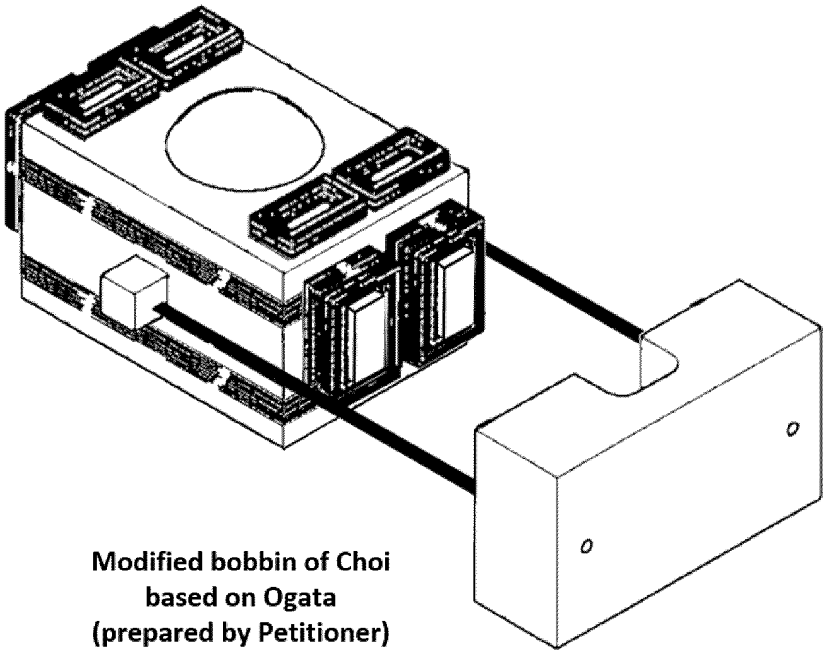
d. 40[e]

See Element 1[d] in Ground 1. The Choi-Ogata combination includes several coils, including the vertically separated focus coils (Choi, 52, 133-134, 162-163; Ogata, 21-22, 84-85), four tracking coils (113), and four tilt coils (114, 114'). Choi, 132-135, 164-167, 182-186. The focusing, tracking and tilt coils interact with magnets (130, 140, 140') to move the blade in the focus, tracking and tilt directions. *Id.*, 131-135, 162-163, 166-170. Any one or a combination of the above-mentioned set of coils or subcoils can be construed as "a plurality of coils."

It would have been obvious to a POSITA that the plurality of coils is connected to an electric circuit because Choi describes driving the coils with an electric current, and it was well known that electric currents are generated by electric circuits. *Id.*, 24-30, 182-182; Mansuripur, ¶¶133-134.

e. 40[f]

This Element is taught or suggested by the Choi-Ogata combination. As explained in Element 40[c], the focus coil is divided into two vertically separated subcoils (adjacent pair of subcoils), and hinges are positioned in the space between them for connecting the elastic wires. Mansuripur, ¶135; *see also* figure below.



Modified bobbin of Choi based on Ogata (prepared by Petitioner)

4. Claim 43: "…wherein the coils are focus and tracking coils and the electric circuit supplies current to the coils in the same direction."

As explained for Element 40[e], the Choi-Ogata combination includes several coils, including the vertically separated ***focus*** subcoils and four ***tracking*** subcoils (113) that interact with magnets (130). Choi, 52-53, 133-135, 162-163; Ogata, 21-22, 84-85.

Regarding the remaining limitations of claim 43, the phrase "the electric circuit supplies current to the coils in the same direction" recites functional limitations that should not be afforded patentable weight. "[A]pparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990). Additionally, this phrase is ambiguous because it is unclear whether the electric current in ***all*** coils, or ***a subset*** (at least

two) of the coils, must be supplied in the same direction. In all scenarios, the Choi-Ogata combination teaches or suggests this limitation.

First, claim 43 does not require movement of the blade in a particular way. Therefore, the claim limitations are satisfied by a system that is *capable* of supplying electrical currents to the coils in the same direction. In the Choi-Ogata combination, all focusing and tracking coils are capable of being driven with currents in the same direction. Notably, in the Choi-Ogata combination, Choi describes focusing and tracking coils, and that its coils are driven by an electric current. Choi, 122-127, 157, 168-170, 182-185; *see* Element 40[e]. It would have been obvious to a POSITA that the direction of the current could be selected for each coil (and subcoil) separately, and all the coils could be driven with the currents in the same direction. Mansuripur, ¶¶136-138.

Second, if this claim is construed to require driving at least two coils with electric currents in the same direction,[7] Choi describes it. The Choi-Ogata combination includes Choi's focusing coil (112) (Choi, 133-135, 162-163), which is divided into two subcoils. See Section V.B.2, *supra*. It would have been obvious to

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[7] In the '055 patent, focusing subcoils 150 are supplied with currents in the same direction to move the blade vertically up or down, depending on the direction of the current. Ex. 1001, 7:43-48; Mansuripur, ¶139.

a POSITA that the two focusing subcoils (112) would be driven with currents in the same direction (either clockwise or counterclockwise) because the two subcoils would be generating a force in the same direction via their interactions with unipolar magnets (130), thus moving the coil in the focusing direction. Mansuripur, ¶¶139-140; *see also* discussion in Ground 1, claim 7.

5. Claim 44: "…wherein the coils are focus and tracking coils, of which the focus coil also serves as a tilt coil and the electric circuit supplies current separately to each of the coils."

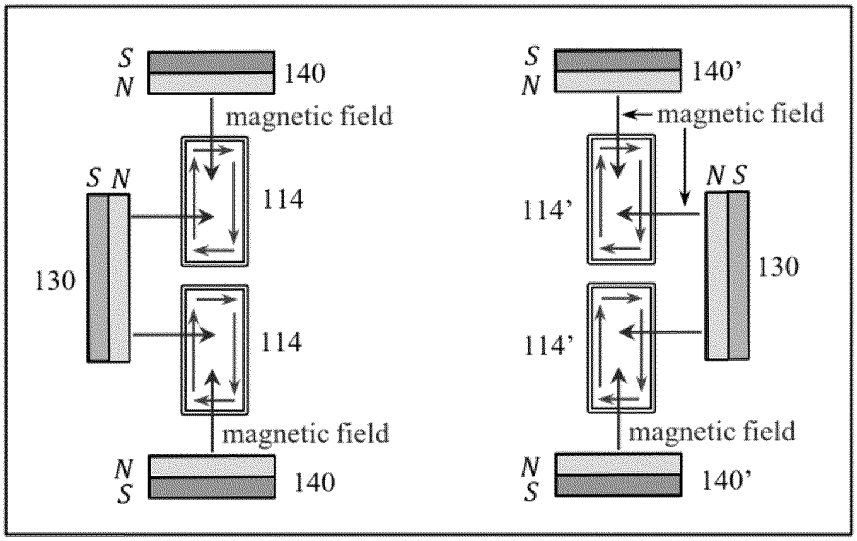
The phrases (1) "the focus coil also serves as a tilt coil," and (2) "the electric circuit supplies current separately to each of the coils" recite functional limitations and thus should not be afforded patentable weight. But even if those limitations are given patentable weight, the Choi-Ogata combination teaches or suggests claim 44.

The combination includes Choi's focusing coils (112) (divided into two subcoils per Ogata), tracking coils (113) and tilt coils (114, 114'). Choi, 133-135, 162-163; *see* claim 40, *supra*. Choi's tilt coils (114, 114') (which could also operate as focusing coils) and tracking coils (113) render claim 44 obvious.

Notably, it would have been obvious to a POSITA that Choi's tilt coils (114, 114') (which remain functionally the same in the combination) would also be used for focusing purposes. Choi describes the interactions between tilt coils (114, 114') and magnetic elements (140, 140') can move the blade in tilt directions (C

and/or D). *Id.*, 166-170. A POSITA would have found it obvious that by selecting the direction of electric currents in each tilt subcoil (114, 114'), the blade can also move up or down in the focusing direction due to the interaction of tilt subcoils (114, 114') with magnetic elements (140, 140') and (130). This is shown in the below illustration, where the energized tilt coils interact with the magnetic field of magnets 130/140/140' to move the bobbin up or down (depending on the direction of the currents). Mansuripur, ¶¶141-149. Accordingly, by selecting to drive all subcoils (114, 114') with electric currents in the same direction, those coils perform a focusing function.[8]

[8] When using tilt coils (114, 114') for focusing function, coils 112 of the Choi-Ogata combination are not energized. Mansuripur, ¶144. Also, as explained for claim 8 in Ground 1, subcoils (114, 114') can still serve as tilt coils by selecting a different set of electric current directions in those coils. *Id.*, ¶147.



Illustrative Figure – Tilt/Focus Operation
(Prepared by Petitioner)

The selection of magnetic poles and direction of currents that energize sub-coils (114, 114') to move the blade in tilt or focusing directions would have been known and obvious to a POSITA having a basic familiarity with the operation of optical pickup and disc drive assemblies. Mansuripur, ¶148.

Choi additionally teaches or suggests an electric circuit for supplying electric currents to the coils. Choi, 122-127, 157, 168-170, 182-185; *see also* element 40[e], *supra*. And, it would have been obvious that the electric current would be supplied separately to each coil and subcoil because it would have allowed the optical pickup assembly to separately perform focusing, tilting and tracking functions, and to move the blade in multiple directions. Mansuripur, ¶149.

6. Claim 45: "…wherein the coils are focus, tracking, and tilt

coils and the circuit supplies current to the coils in opposite directions."

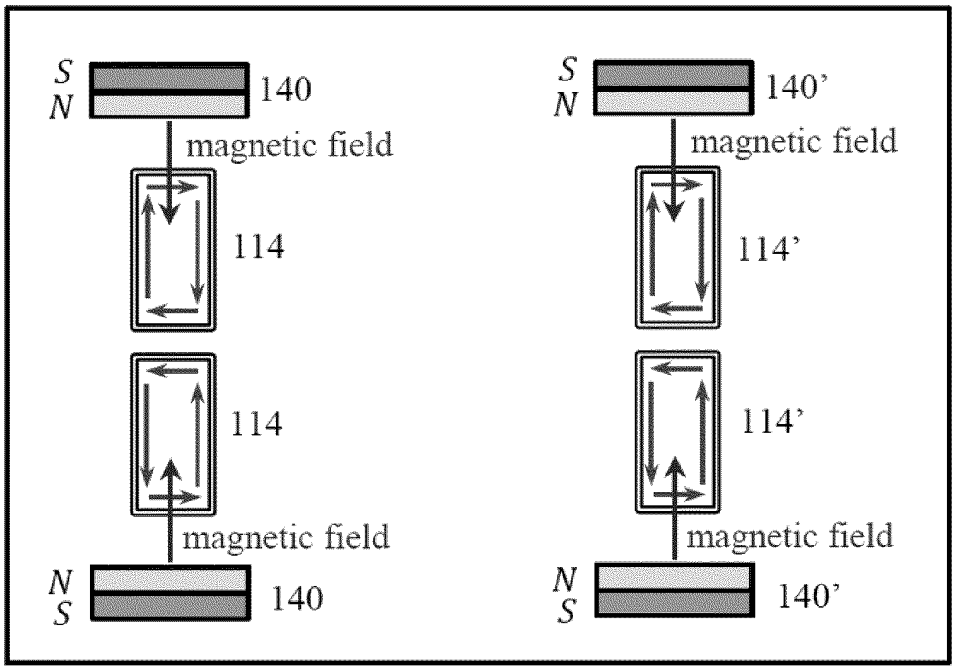
The phrase "the electric circuit supplies current to the coils in opposite directions" recites functional limitations that should not be afforded patentable weight.

Additionally, this phrase is ambiguous because it is unclear whether all or only a subset of the coils is supplied with currents in opposite directions. Further, it is unclear, if there are more than two coils (e.g., three coils), how the currents can be in opposite directions, given that a current can either flow in a clockwise or counterclockwise direction. Mansuripur, ¶150.

Nonetheless, all focusing, tracking and tilt coils in the Choi-Ogata combination are capable of being driven with currents in any direction–the same or opposite directions. Notably, Choi describes focusing, tracking and tilt coils that are driven by an electric current. Choi, 122-127, 157, 168-170, 182-185; *see* Element 40[e]. It would have been obvious that the current's direction would be selected for each coil (and subcoil) separately, and any coil would be driven with a current in any direction (clockwise or counterclockwise). Mansuripur, ¶151.

Further, if this claim is interpreted to require the electric currents in two coils to be supplied in opposite directions, the combination renders this claim obvious. As shown in the below illustration, a POSITA would have found it obvious that tilt subcoils (114) (and/or tilt subcoils 114') would be driven with currents in

opposite directions to perform a movement in tilt direction C.[9] *See* claim 8 in Ground 1; Mansuripur, ¶152.



Illustrative Figure – Tilt Coil Interaction (Prepared by Petitioner)

C. Ground 3: The Choi-Ogata-Santo Combination Renders Obvious Claims 41-42.

Santo relates to an objective lens-driving apparatus used for recording/reproducing information on an optical disc. Santo, 1:3-7.

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[9] The '055 patent describes that in some configurations "the current is supplied to the [tilt] coils 131 and 132 in opposite directions." Ex. 1001, 7:26-27.

In this Petition, Santo is used for its description of multiple support wires that attach to multiple connection points (hinges) on the blade. Specifically, in Santo's Figure 10, "suspension wires 53a, 53b, 53c, and 53d are each fastened at one end to the interconnecting printed board 9a or 9b and at the other end to the wire holder 11. There are six suspension wires in total." *Id.*, 16:25-28; Fig. 10 (annotated below). While only 4 wires are visible in Figure 10, Santo explains six wires 53a to 53f are present, and each wire pair supplies electric current to a different pair of focusing and tracking coils. *Id.*, 17:4-9; Mansuripur, ¶¶153-155.

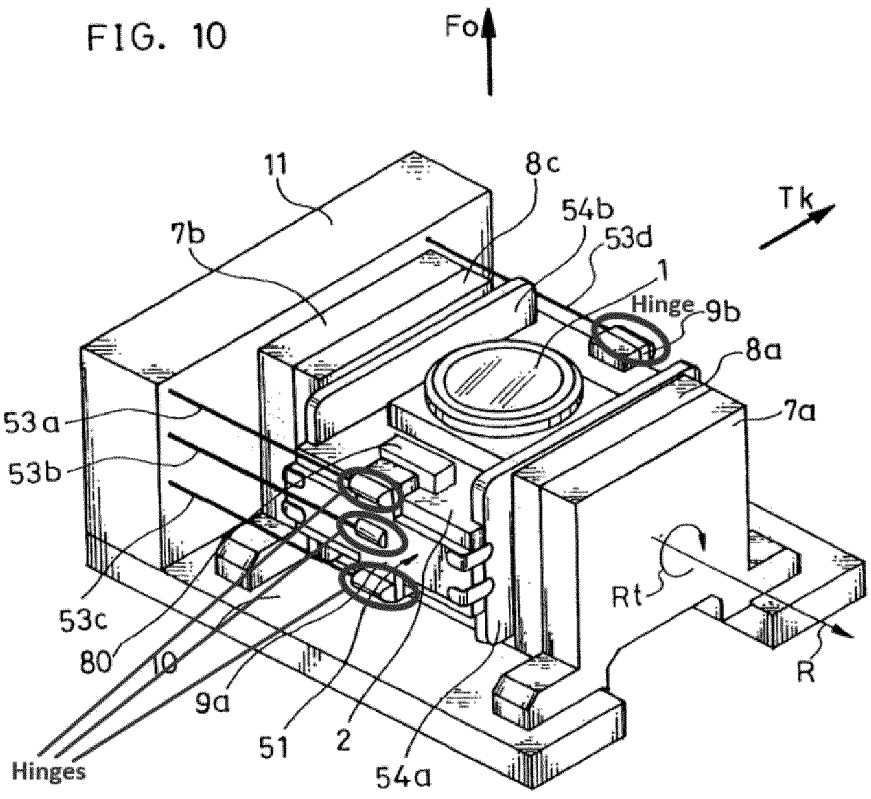


Figure 10 of Santo (annotated)

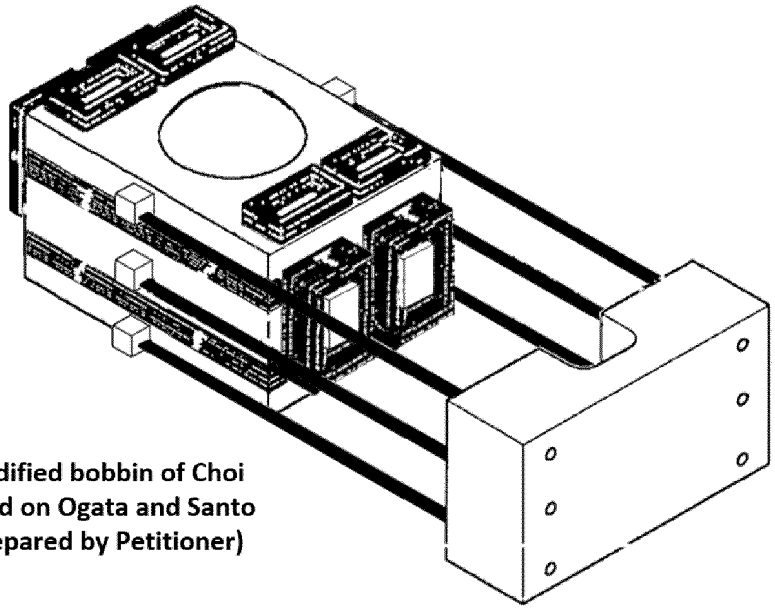
1. Claim 41: "…wherein the plurality of suspension wires are

at least six suspension wires and the coil is divided into three or more sub-coils."

As explained in Ground 2, the Choi-Ogata combination renders claim 40 obvious.

In the Choi-Ogata-Santo combination, a POSITA would have augmented the Choi-Ogata combination based on Santo to include two additional pairs of connections points (one pair on the top and one pair on the bottom of the blade's side), for a total of six connection wires. The below figure is an illustration of the modified configuration with six connection points (hinges)[10] on the blade and six associated wires movably supporting the blade on the base. Mansuripur, ¶¶156-157.

[10] Only four hinges are visible in this perspective view.



Modified bobbin of Choi based on Ogata and Santo (prepared by Petitioner)

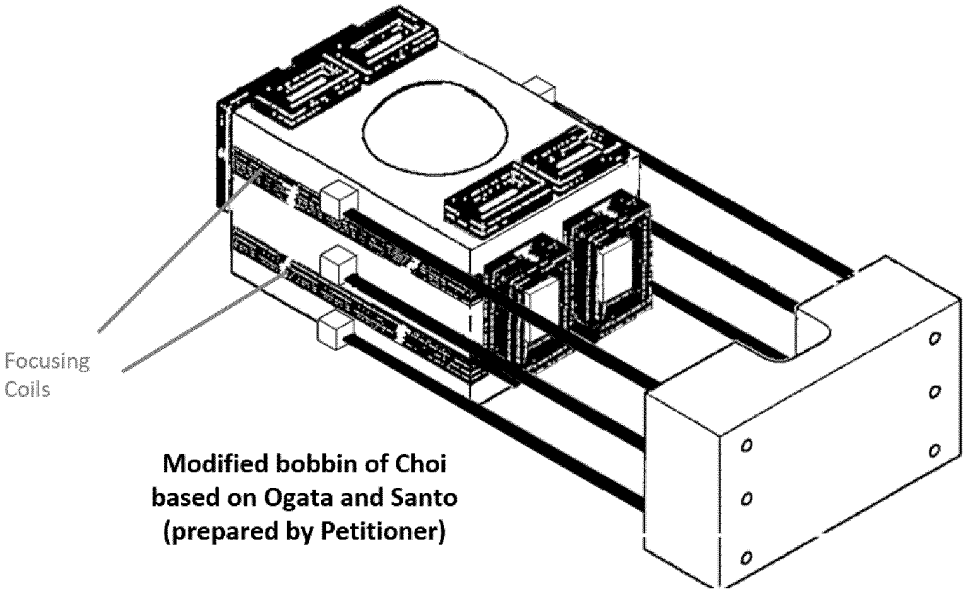
In the combination, the coil is divided into three or more subcoils, including the two focusing subcoils, four tilt subcoils (114, 114') and four tracking subcoils (113).

The inclusion of additional hinges and suspension wires would have been obvious to a POSITA because the pickup assembly in the Choi-Ogata-Santo combination included three different types of coils (tracking, tilt and focus coils), and having six hinges and six suspension wires would have allowed each pair of suspension wires to deliver electrical current to a different set of coils, consistent with Santo's description. Santo, 17:4-9. Furthermore, additional hinges and connection points would have provided a more secure and stable platform and would have distributed the weight of the blade and associated components (objective lens, coils,

etc.) among additional support points, thus improving the performance and longevity of the optical pickup assembly. Mansuripur, ¶¶158-161.

2. Claim 42: "…wherein a first hinge and a second hinge are positioned on each of a top and a bottom of one of the coils, respectively, and a third hinge is positioned between two of the subcoils."

This claim is rendered obvious by the Choi-Ogata-Santo combination, as explained for claim 41. As illustrated below, the top (and bottom) pair of hinges are on top (and bottom) of the focus coils, and the middle pair of hinges is between the two focus coils. Mansuripur, ¶162.



Modified bobbin of Choi based on Ogata and Santo (prepared by Petitioner)

D. Ground 4: Choi and Ikeda Render Obvious Claims 7-8

Choi describes interactions between magnets (130) and (140/140') with the corresponding coils (Choi, 134-135, 168-170) without explicitly stating those interactions occur with unipolar magnets. However, based on the explicit teachings of

Ikeda, a POSITA would have found unipolar interaction of magnets (130) and (140/140') with the corresponding coils obvious.

Ikeda describes an objective lens driver that includes a base, a support shaft, a pair of yokes, an objective lens, a focusing coil (24) and at least a pair of tracking coils (25). Ikeda, Abstract.

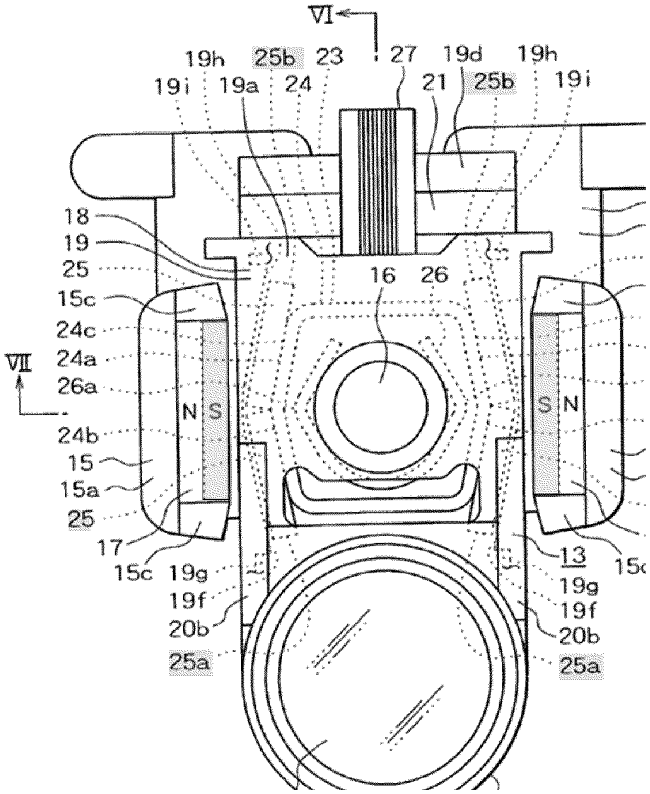


Figure 5 of Ikeda (annotated)

Ikeda explains: "pairs of tracking coils 25 are fitted respectively to both side portions 24a of a focusing coil 24 wound in a roughly prismatic form" (*id.*, ¶54), and both focusing coil (24) and tracking coils (25) interact with the same polarity (south pole) of magnetic elements 17 (see annotated Fig. 5 above). *Id.*, ¶45: "The

magnets 17 have the same pole on their surfaces facing to each other, and their surfaces on the side of the support shaft 16 are S poles (See FIG. 5)." *See also*, *id*., ¶¶66, 73-74, 77; Mansuripur, ¶¶163-166.

A POSITA would have been guided by the teachings of Ikeda and would have found it obvious that interaction of coils in Choi would be with magnets 130 (in claim 7) and with magnetic elements 140/140' (in claim 8) that have the same polarity. Notably, Ikeda reinforces a POSITA's understanding of Choi's optical pickup operation based on unipolar interaction as explained in Ground 1. Mansuripur, ¶167.

E. Ground 5: The Choi-Ogata-Ikeda Combination Renders Obvious Claims 40 and 43-45

As in Ground 4, Ikeda corroborates the teachings of Choi and provides further obviousness confirmation that Choi's coils interact with magnets 130, 140/140' in a unipolar fashion. In the Choi-Ogata-Ikeda combination in Ground 5, the analyses of claims 40 and 43-45 of Ground 2 are augmented by the knowledge of a POSITA, as confirmed by Ikeda, that magnets (130, 140/140') of Choi interact with the magnetic fields of tracking, focusing and/or tilt coils in unipolar fashion, in rending claims 40 and 43-45 obvious. Mansuripur, ¶168.

F. Ground 6: The Choi-Ogata-Santo-Ikeda Combination Renders

Obvious Claims 41-42

As explained in Ground 4, Ikeda corroborates the teachings of Choi and provides further obviousness confirmation that Choi's coils interact with magnets 130, 140/140' in unipolar fashion. In the Choi-Ogata-Santo-Ikeda combination, the analyses of claims 41-42 in Ground 3 are augmented by the knowledge of a POSITA, as confirmed by Ikeda, that magnets (130) of Choi interact with the magnetic fields of tracking and/or focusing coils in unipolar fashion. Mansuripur, ¶169.

G. Ground 7: Ogata and Kamata Render Obvious Claims 36-38

Kamata relates to "an actuator device for an optical pickup that records or reproduces information on a medium such as a compact disc." Kamata, 45-56. Kamata's optical pickup actuator includes a lens holder holding an objective lens, a focus coil, a pair of tracking coils, and a magnet and a yoke. *Id.*, 34-37. Kamata's yoke (Figure 2—annotated below) includes "auxiliary yokes 12 [that] are integrally formed on both sides of…yoke 3 whose upper end is open, and which are bent approximately at right angles to one inner wall surface 3a." *Id.*, 119-120.

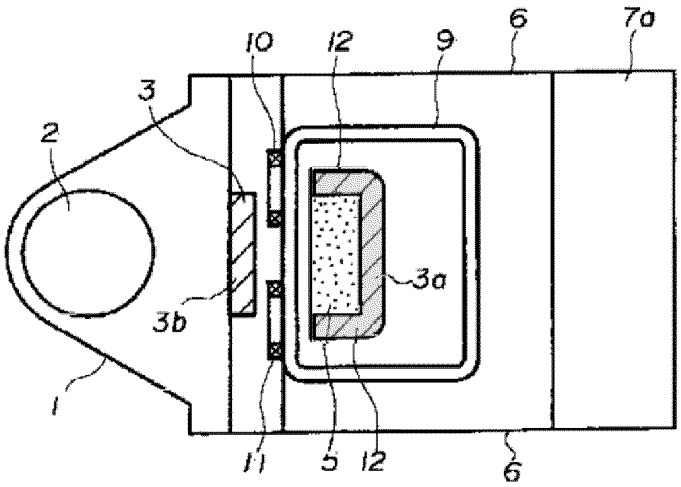
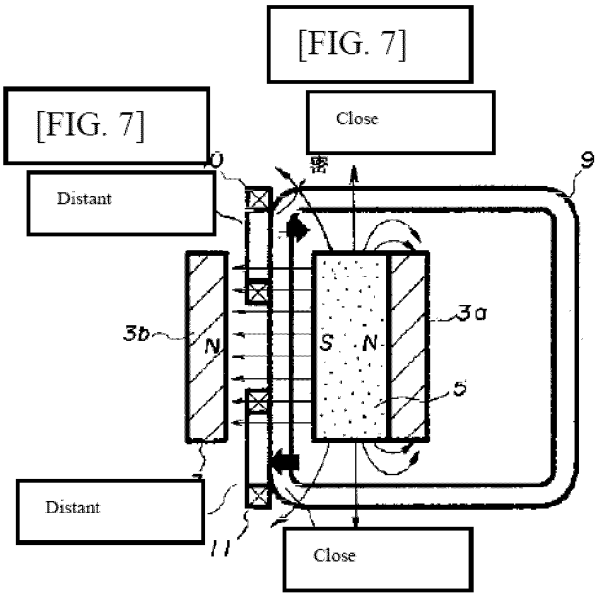


Figure 2 of Kamata (annotated)

Kamata seeks to solve a problem associated with conventional systems with a straight yoke (e.g., Kamata's Figure 7 below), where "…magnetic flux [is] directed obliquely to the tracking coils 10 and 11 from both sides of the permanent magnet 5, so that the magnetic flux density distribution on both sides of the tracking coils 10 and 11 is in an unbalanced state." *Id.*, 68-71.



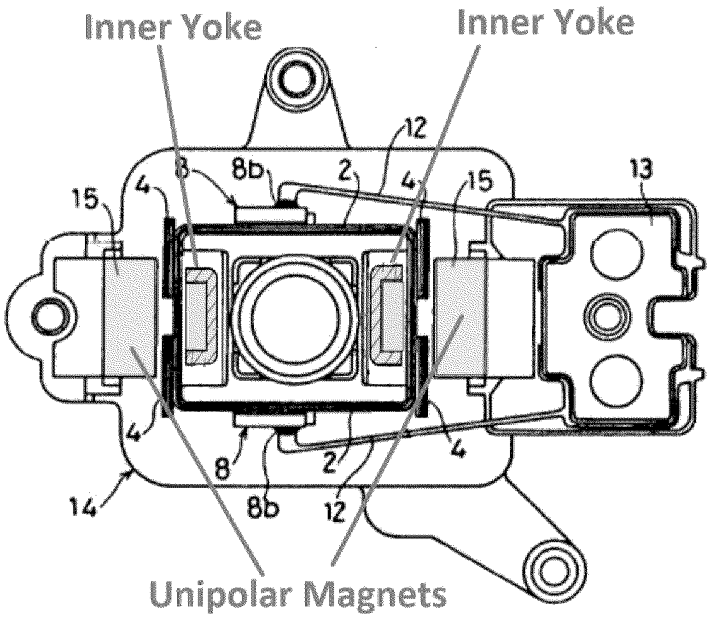
Kamata's solution entails using a yoke with two bent sections (see Fig. 2) that "reduce the magnetic flux directed obliquely from the permanent magnet 5 to both the tracking coils 10 and 11." *Id.*, 121-124. Thus, a more uniform magnetic field density around the tracking coils is generated, and the undesirable rotational movements of the lens holder are eliminated. *Id.*, 153-155; *see also*, *id.*, 89-90; Mansuripur, ¶¶170-173.

Motivation to Combine: Both Ogata and Kamata related to optical pickup devices for reading/recording information on optical discs (Ogata, 29-31, 81-87; Kamata, 45-46) and both sought to improve the operations of optical disc drives. Ogata, 104-108, 187; Kamata, 83-90. Thus, a POSITA would have been motivated to combine the complementary teachings of these references with the shared goal of improving the operation of optical disc drives. Mansuripur, ¶¶174-175.

Further, Kamata had recognized a problem in prior art systems that used two adjacent tracking coils (e.g., shown in Kamata's Figure 7 and also in Ogata's Figure 4): those configurations generated an unbalanced magnetic field around the tracking coils. Kamata, 68-71. And Kamata proposed a solution by adding two bent sections to its inner yoke (see Figures 2 and 4) to produce a uniform field around the tracking coils and to remove the undesirable rotational movements. *Id.*, 89-90, 121-124, 153-155. Therefore, a POSITA would have been motivated to augment Ogata's optical drive support by incorporating an inner yoke with two

bent sections, as taught by Kamata, to improve the magnetic field uniformity of its tracking coils and improve the optical pickup's operation. Mansuripur, ¶¶179-177.

The Combined System: The combination would have included Ogata's optical drive support modified to include Kamata's inner yoke with two bent end sections, as exemplified in Ogata's modified Figure 4 below. Mansuripur, ¶179.



Modified Figure 4 of Ogata

Reasonable expectation of success: A POSITA would have had a reasonable expectation of success because a very similar modification was described in Kamata. Kamata, 116-118. Additionally, those modifications would have improved the operations of Ogata's device, as explained above. The modifications involved routine mechanical modifications to Ogata's device that were well within the capabilities of a POSITA. Mansuripur, ¶¶177-178.

1. Claim 36

a. 36[pre]: "An optical pickup actuator for use with an objective lens on a base, comprising:"

Ogata describes the preamble because it describes: "[a] lens drive support, equipped with an objective lens holder having an objective lens that focuses a light beam on an optical recording medium." Ogata, 18-19. Ogata further describes a base as substrate 14. Ogata, 112: "the lens drive support is equipped with a substantially rectangular substrate 14." S*ee also*, *id.*, 114-116, 156, Figures 3 and 4; Mansuripur, ¶180.

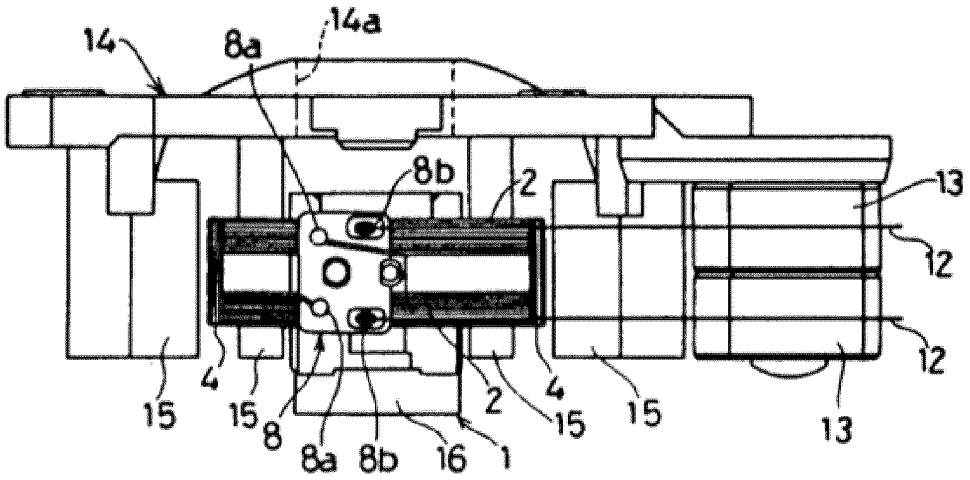


Figure 3 of Ogata

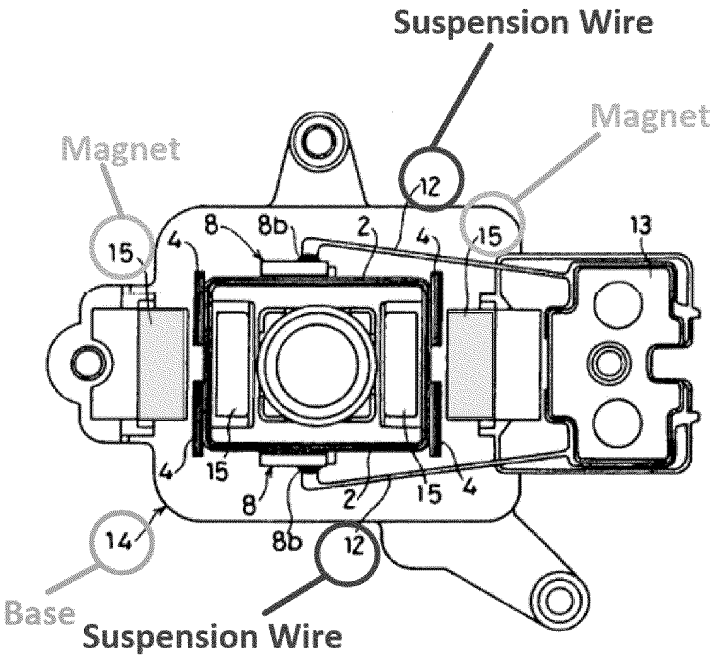


Figure 4 of Ogata (annotated)

b. 36[a]: "a blade holding the objective lens;"

Ogata describes a blade for holding an objective lens, as illustrated in Figure 1 (annotated below). Ogata, 112-114. The blade accommodated focus coils 2, radial drive (tracking) coils (4), and included an opening (1) for holding an objective lens. Ogata, 81-84, 119-125, 151-152, Fig. 1; Mansuripur, ¶181.

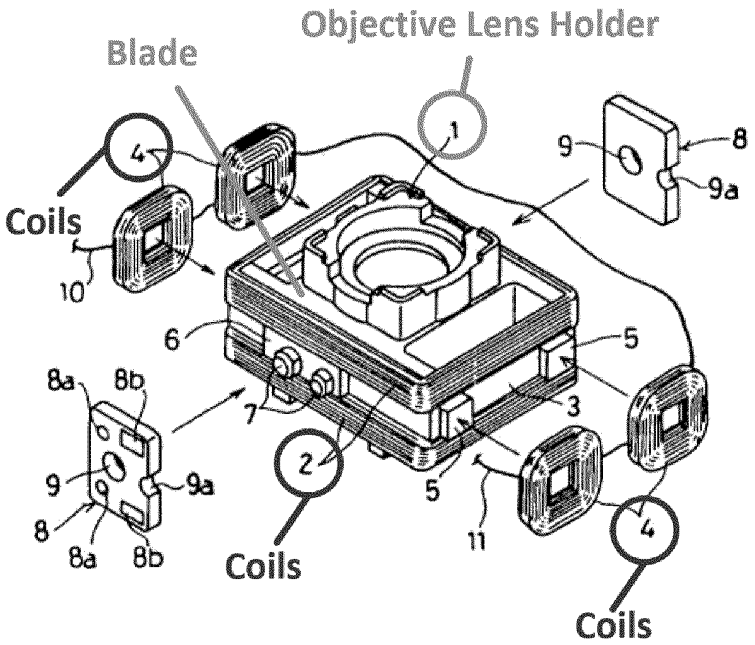


Figure 1 of Ogata (annotated)

c. 36[b]: "a plurality of suspension wires movingly supporting the blade on the base;"

Ogata describes a plurality of suspension wires as four leaf springs (12) (Ogata, 156-157) that support the blade on the base because they are connected to the blade at one end, and, on the other end, to the drum support member (13) positioned on the substrate (14) ("base"). *Id.* Accordingly, the blade is "***movable*** in the focus direction and the radial direction." *Id.*, 157-158, Fig. 4 (annotated below); Mansuripur, ¶182.

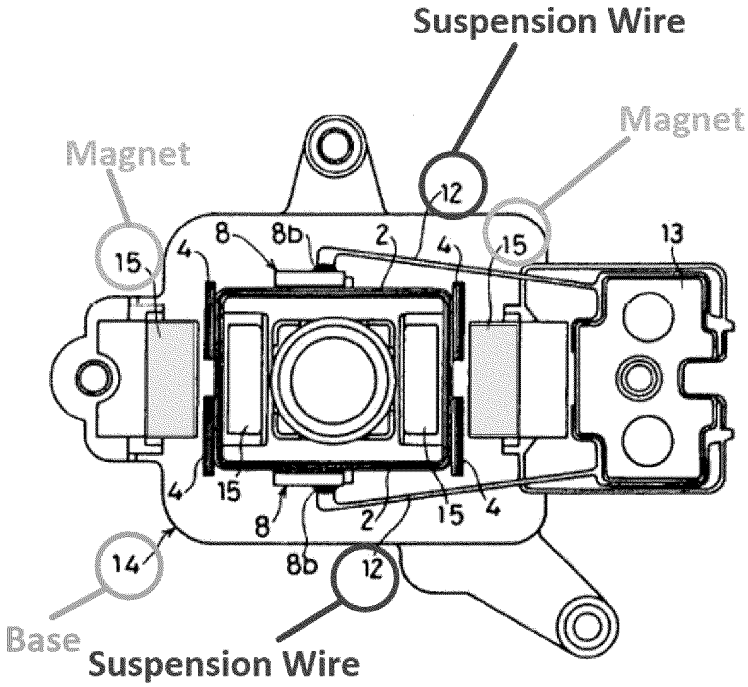


Figure 4 of Ogata (annotated)

d. 36[c]: "a pair of unipolar magnets positioned on the base; and;"

Ogata describes a pair of magnets (15)[11] that are positioned on substrate (14) (base). *See* green-annotated elements in Fig. 4 above; Ogata, 114-118.

Ogata does not explicitly state the magnets are unipolar, but this would have been obvious to a POSITA because the annotated magnets interacted with focus

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[11] Ogata's Figure 4 mistakenly labels both pairs of magnets residing within and outside of the blade with reference number 15. Ogata's specification makes it clear that the magnet pair positioned further out from the center should be labeled with reference number 17. Ogata, 114-118, 163; Mansuripur ¶183.

coils (2) that wrapped around the blade, and the same pole of those magnets would be facing the focus coils to allow proper up/down movement of the blade. *See*, claim 7 in Ground 1. The unipolar interaction of tracking coils (4) with magnets (15) are further corroborated by Ikeda, as explained in Ground 4. Mansuripur, ¶¶183-186.

e. 36[d]: "a plurality of coils positioned on the blade and interacting with the unipolar magnets to create an electromagnet force to move the blade; and;"

Ogata describes a plurality of coils as focus coils (2) and radial direction drive coils (4) (i.e., tracking coils) positioned on the blade. Ogata, 126-130; Fig. 1 (annotated below). Ogata's coils interact with magnetic elements (annotated in green in Figure 4 above) to move the blade in focusing and radial (tracking) directions. *Id.*, 161-163; Mansuripur, ¶187.

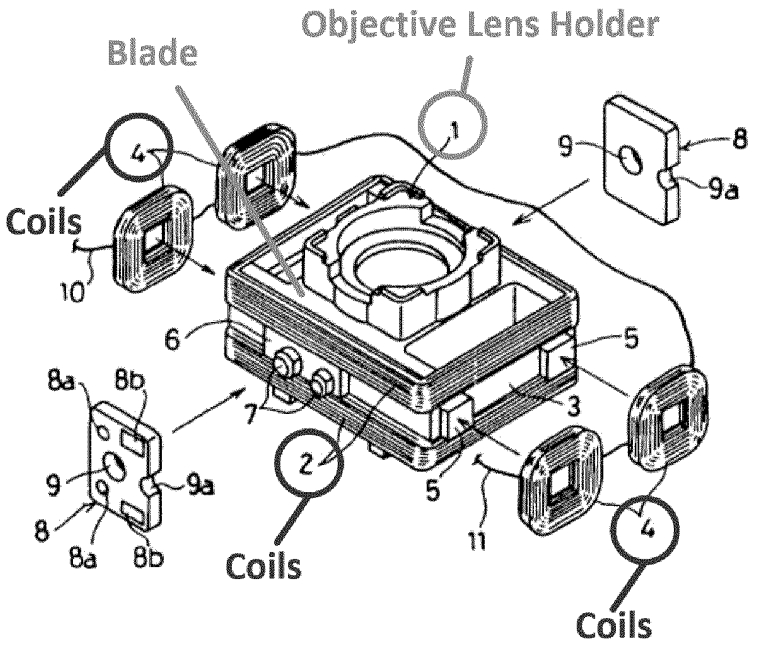


Figure 1 of Ogata (annotated)

f. 36[e]: "an inner yoke positioned inside a cavity defined by the walls of a coil, wherein the yoke comprises three sections with each of the three sections of the yoke being parallel to a different wall of the cavity to increase an effective area facing the magnets."

The Ogata-Kamata combination teaches or suggests this limitation. As explained above, in the combination, Kamata's inner yoke having two bent end sections is added to the magnets that are located inside the blade of Ogata. The inner yokes in this combination are attached to substrate (14) (base) and are positioned in a cavity augmenting Ogata's original magnets.

A cavity defined by the walls of a coil: To the extent PO or the Board interprets the "cavity" as a space inside a coil, the Ogata-Kamata combination teaches or suggests it in the form of the hollow region surrounded by and defined by focus coil (2) of Ogata, as illustrated below.

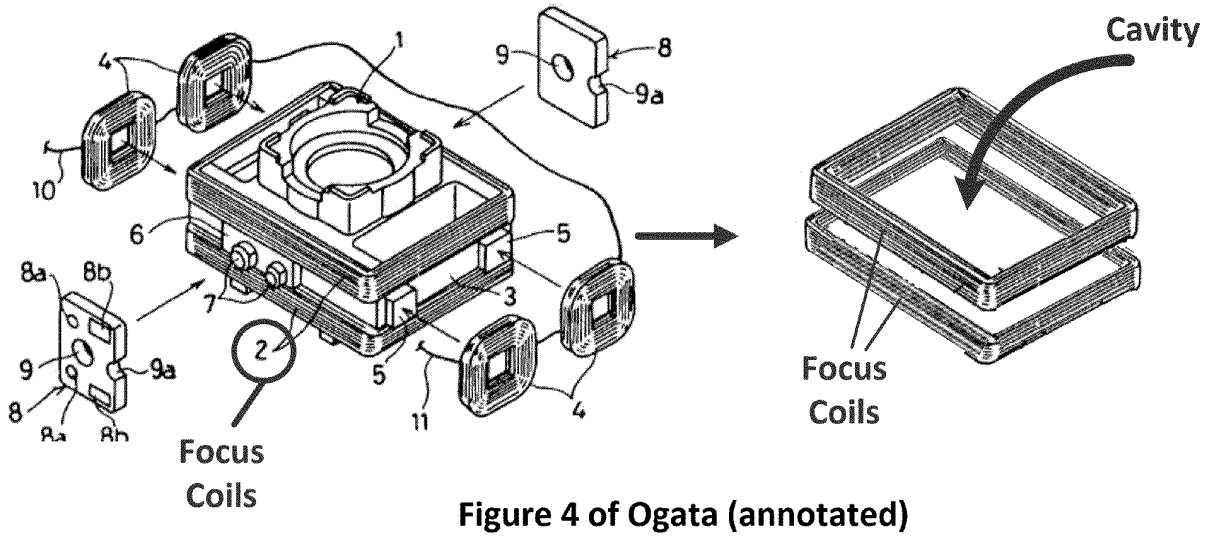
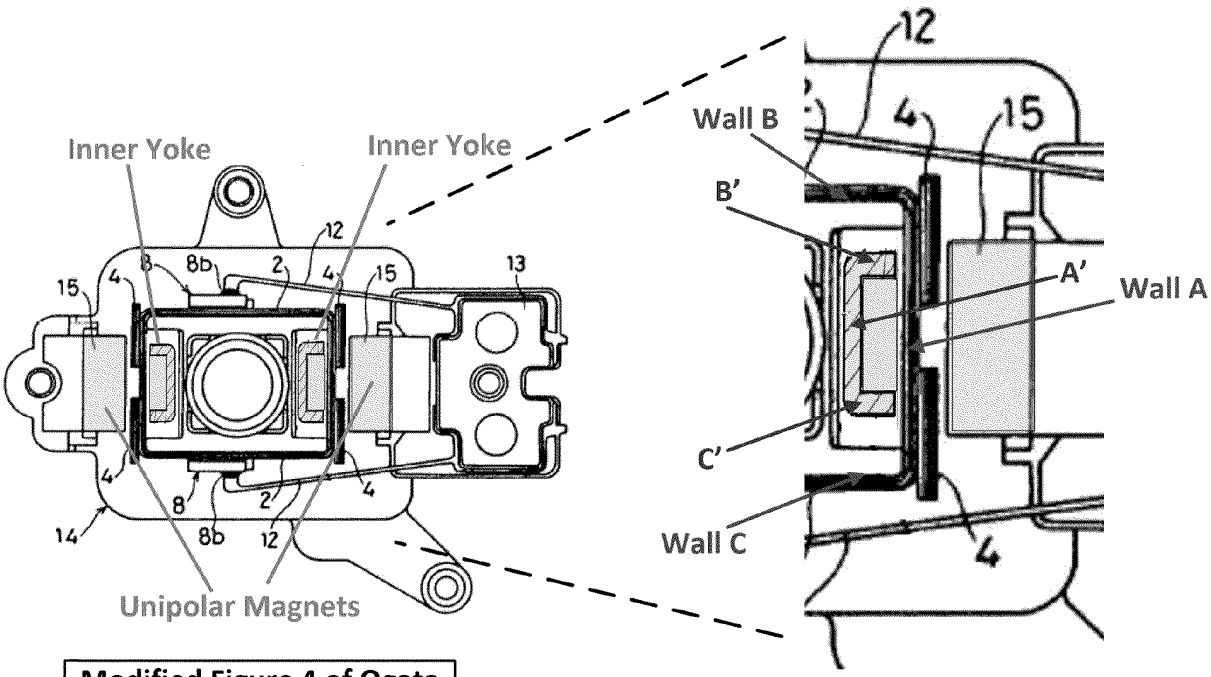


Figure 4 of Ogata (annotated)

The inner yoke (annotated in cross-hatched green in modified Figure 4 below) has three sections: a first bent section (B'), a second bent section (C'), and a straight section (A'); each of the sections, A', B' and C', is parallel to a different wall of the cavity: walls A, B, and C, respectively, as shown below. Mansuripur, ¶¶188-190.



Modified Figure 4 of Ogata

In the event PO or the Board interprets the "cavity" to be part of the blade, Ogata's blade includes two hollow regions that already exist inside the blade, as shown in the annotated figure below. Each hollow region (cavity) is defined by the walls of focus coils (2) because each cavity is enclosed and defined by the wall of the upper focus subcoil and the wall of the lower focus subcoil.

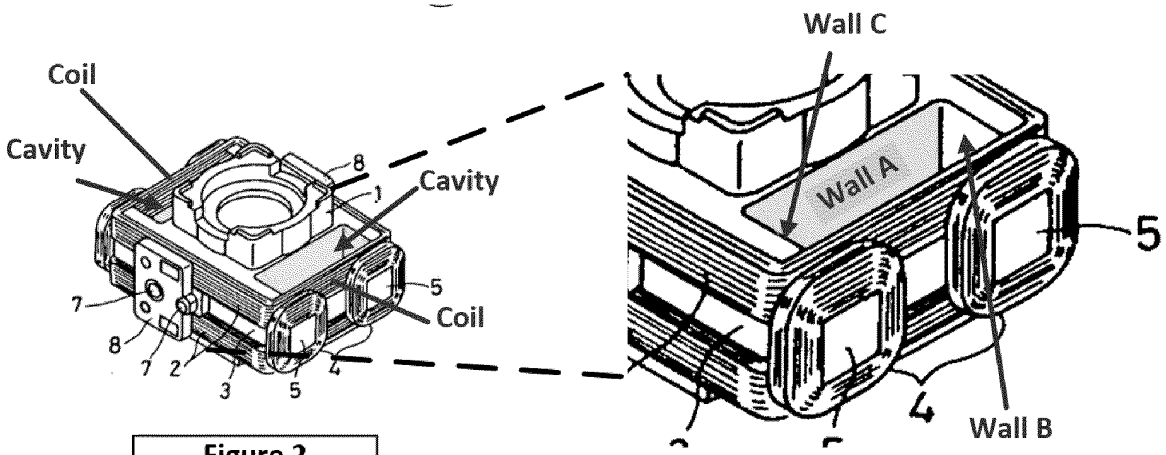
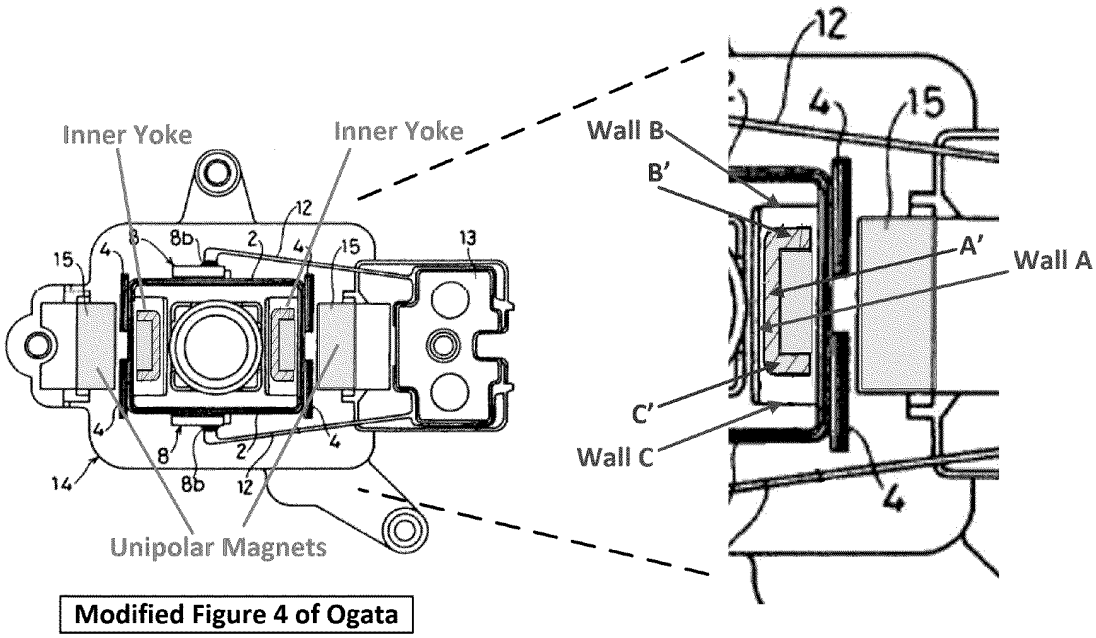


Figure 2

(Annotated Figures of JHP04113524A)

In the combination, the inner yoke (green cross-hatched in Figure 4 below) has three sections: a first bent section (B'), a second bent section (C'), and a straight section (A'); each of the sections, A', B' and C', is parallel to a different wall of the cavity: walls A, B, and C, respectively, as shown below. Mansuripur, ¶¶191-192.



Modified Figure 4 of Ogata

Element 36[e] further recites: "…to ***increase*** an effective area facing the magnets," [12] which is ambiguous because it fails to specify a prior condition or structure with respect to which an increase is effectuated. *See Liberty Ammunition, Inc. v. United States*, 835 F.3d 1388, 1395 (Fed. Cir. 2016).

Nonetheless, this limitation is rendered obvious because the Ogata-Kamata combination's yoke has two bent sections that operate to confine and strengthen the magnetic field acting on the tracking coils, thus providing a larger effective area facing magnet 15 compared to a yoke without the bent sections (and compared to Ogata having no inner yoke at all). Kamata, 128-129; Mansuripur, ¶193.

2. Claim 37: "…wherein one of the coils is divided into a plurality of subcoils that are separated from one another."

In the Ogata-Kamata combination, Ogata's focus coils (2) are separated from one another. *See* annotated Fig. 1 below; Mansuripur, ¶194.

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[12] This is a functional limitation and should not be given patentable weight. *See* claim 43 in Ground 2.

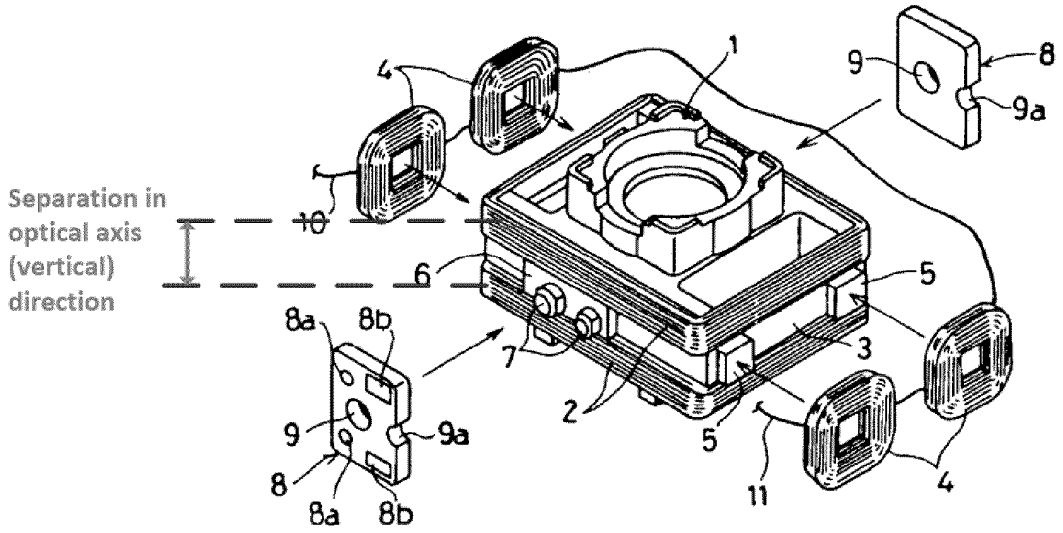


Figure 1 of Ogata (annotated)

3. Claim 38: "…wherein one of the coils is positioned to surround the sides of the blade."

In the Ogata-Kamata combination, Ogata's focus coils (2) surround the sides of the blade. *See* annotated Fig. 1 above; Mansuripur, ¶195.

H. Ground 8: Kabasawa Alone or in View of AAPA Renders Obvious Claims 17, 21, 23-24 and 28

Kabasawa describes an optical pickup apparatus with improved resonance characteristics appropriate for a notebook PC. Kabasawa, Abstract. Kabasawa's optical pickup apparatus includes an objective lens (4), focus coils (7a,b), tracking coils (8a-8d), yokes (13,14), and permanent magnets (15) that interact with the coils. *Id.*, Abstract, Table on p. 3, ¶¶43-44, 49, Fig. 1; Mansuripur, ¶196.

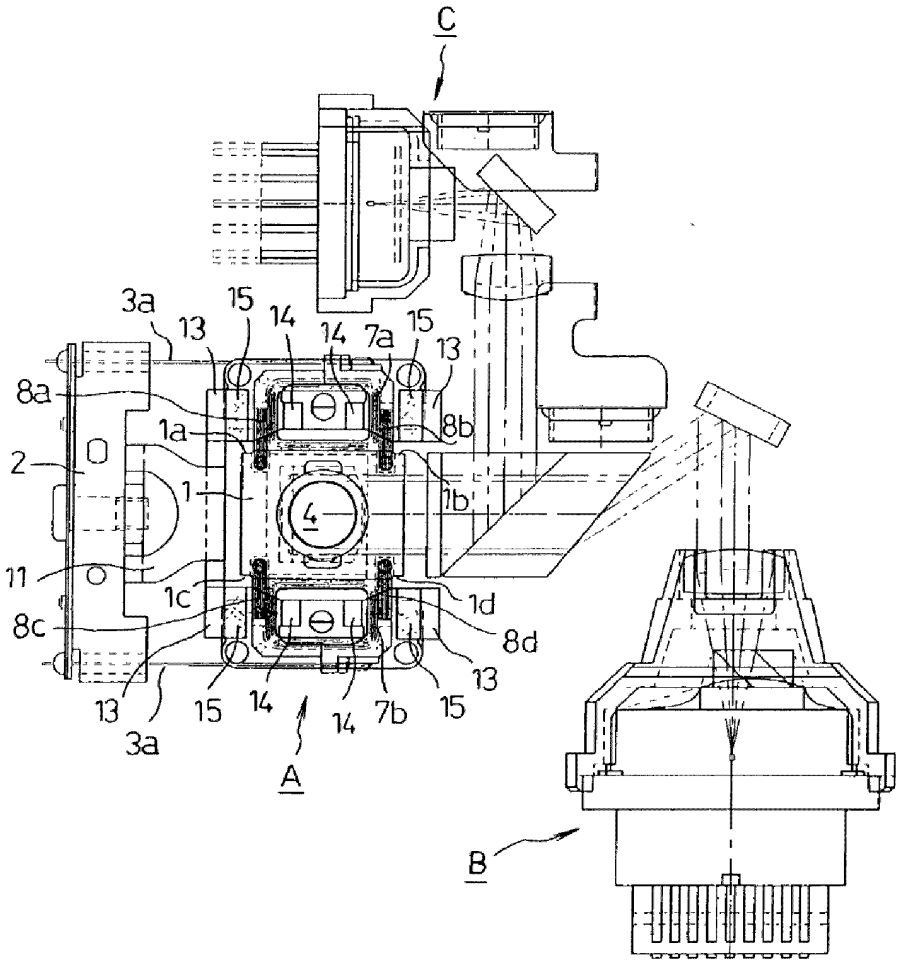
1. Claim 17

a. 17[pre]: "An optical pickup actuator for use with an

objective lens on a base, comprising:"

Kabasawa describes an optical pickup actuator as part of its optical pickup apparatus that includes a base (11), accommodating a lens holder (1) for holding an objective lens (4), and focus (7a, 7b) and tracking (8a-8d) coils that move the lens holder in focus and tracking directions. Kabasawa, Abstract, Table on p. 3, ¶¶33, 44, 48, Figs. 1-3; Mansuripur, ¶197.

Fig. 1



b. 17[a]: "a blade holding the objective lens;"

Kabasawa describes a blade as a lens holder (1) (see Fig. 2 below) that "holds an objective lens 4 in the middle." Kabasawa, Table on p. 3, ¶¶34, 44, Figs. 1 and 2; *see also* Element 1[a] in Ground 1 regarding the terminology blade and lens holder. Mansuripur, ¶¶49-50, 198.

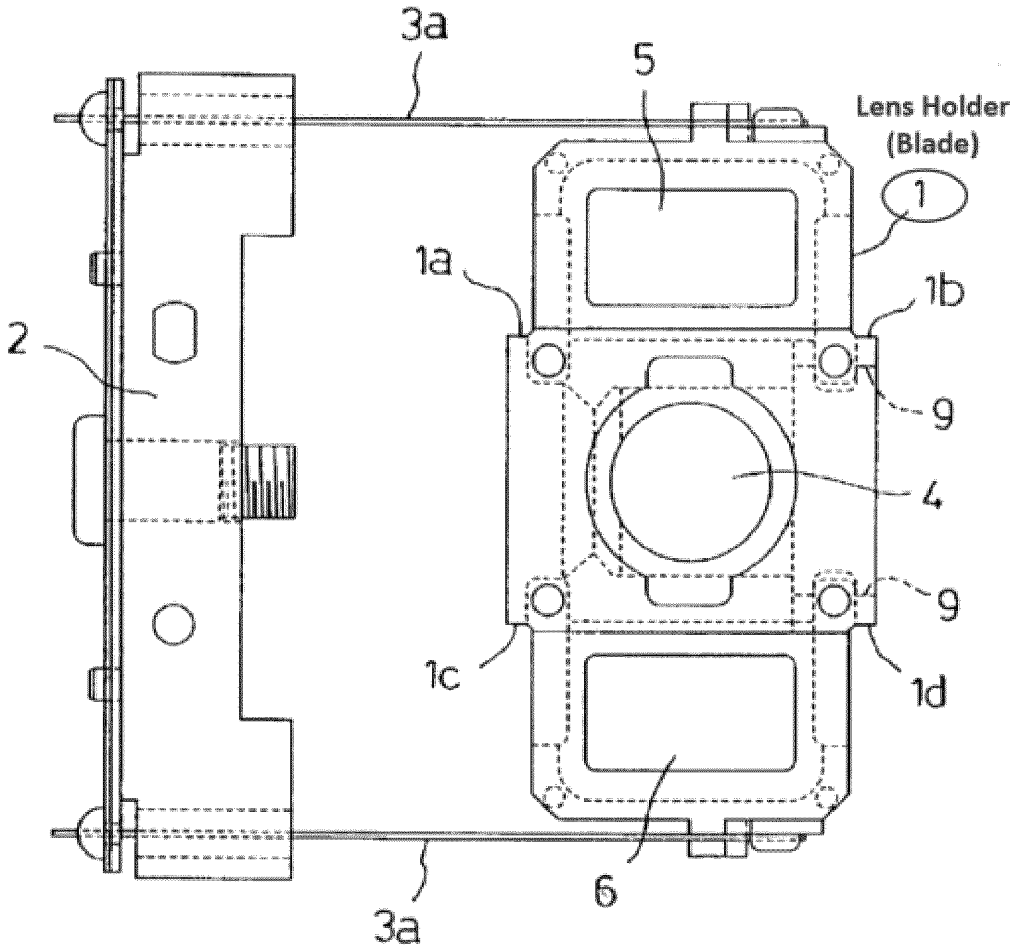


Figure 2 of Kabasawa (Annotated)

c. 17[b]: "a plurality of suspension wires supporting the

blade on the base so that the blade is elastically movable;"

Kabasawa describes a plurality of suspension wires: "three suspension wires 3a, 3b, 3c per one side," that attach lens holder 1 to a suspension holder 2. Kabasawa, Table on p. 3, ¶44, Figs. 2 and 3.

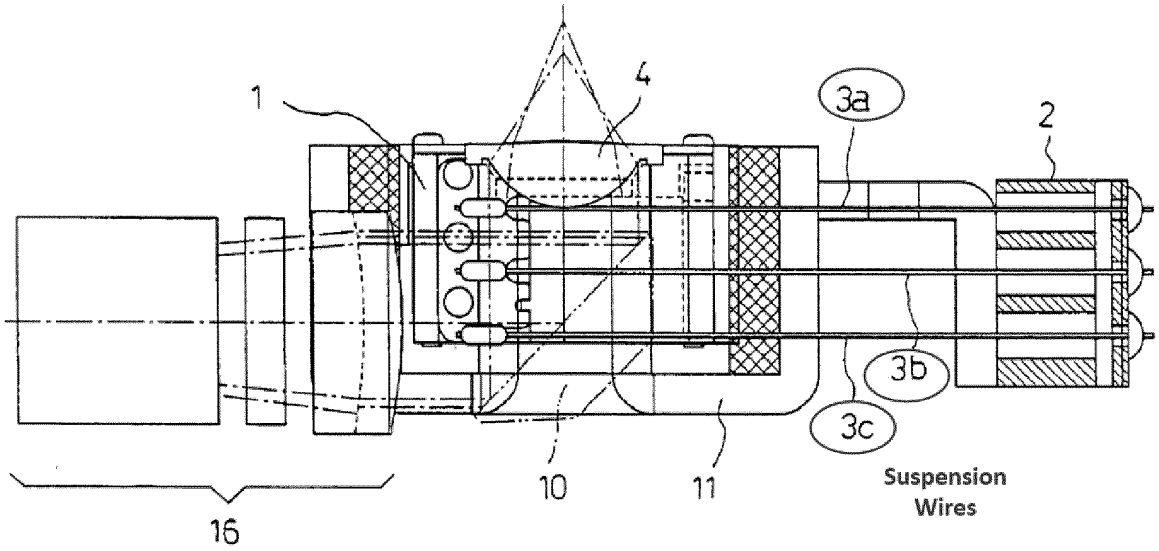


Figure 3 of Kabasawa (Annotated)

Furthermore, all suspension wires are elastic, and the middle suspension wire is made more flexible than the top and bottom ones. *Id.*, ¶¶46, 47; Mansuripur, ¶¶199-200.

d. 17[c]: "a pair of first coils positioned horizontally on the blade and disposed opposite each other with respect to the objective lens in a first direction;"

Kabasawa describes a pair of first coils as focus coils (7a,b) shown in annotated Figure 1 below. *See* Kabasawa, Abstract, Table on p. 3, ¶44. Focus coils

(7a,b) are positioned horizontally on the blade and are opposite each other with respect to the objective lens (i.e., element labeled 4). *Id*.

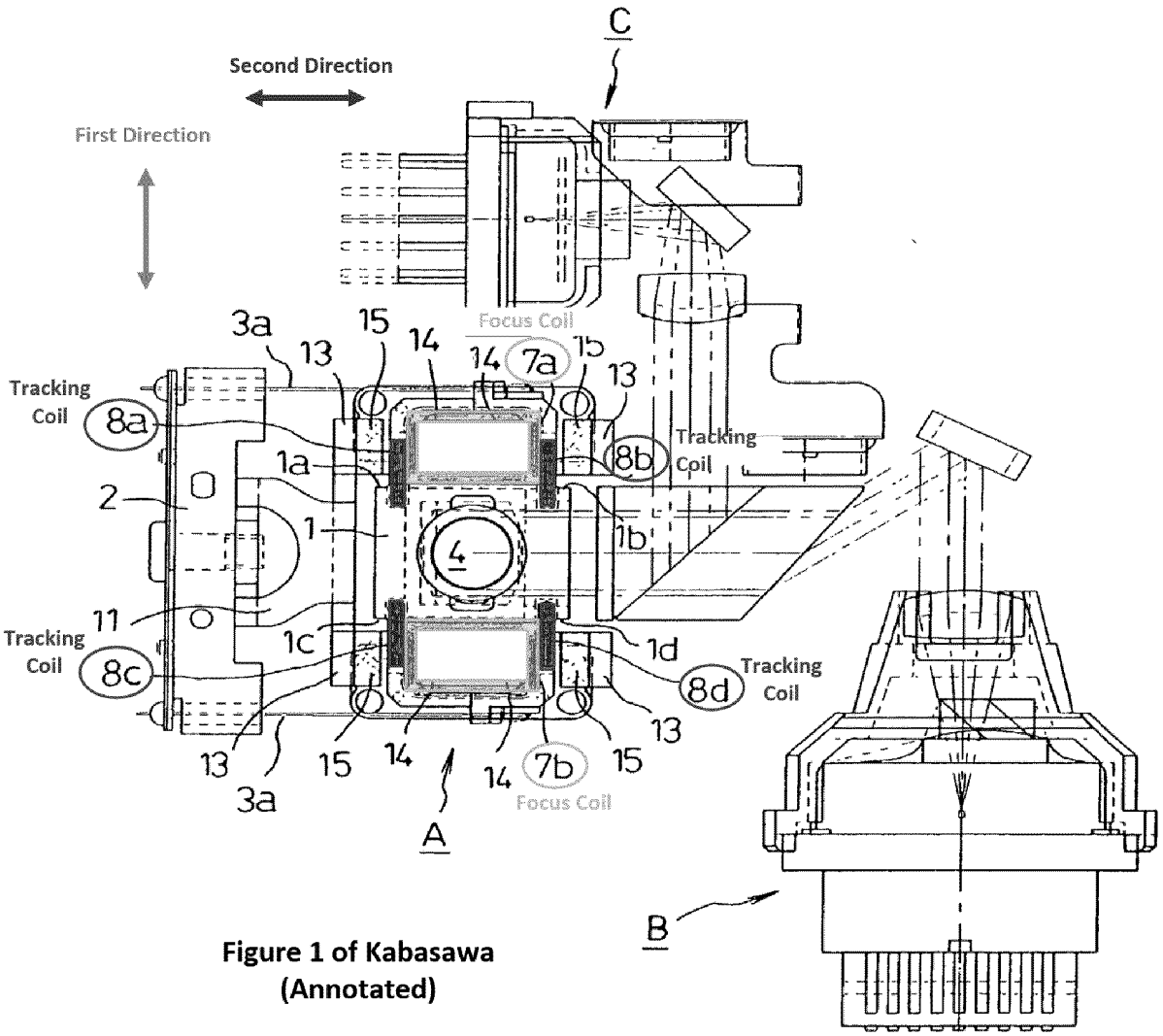
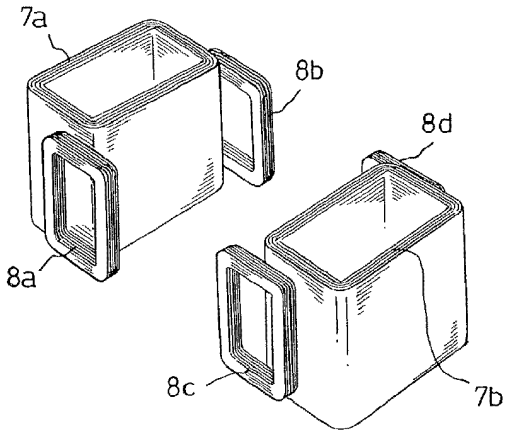


Figure 1 of Kabasawa (Annotated)

Focus coils (7a,b) are positioned in the first direction (see annotated Fig. 1 above), and are wound in the horizontal direction, as further illustrated in Kabasawa's Figure 6. *See also* Ground 1, Element 1[d], for explanation of "horizontal" configuration of the coils. Mansuripur, ¶¶201-202.

Fig. 6



e. 17[d]: "a second coil positioned vertically on a side of the blade in a second direction perpendicular to the first direction; and"

Kabasawa describes a second coil as tracking coils (8a-8d), positioned on a side of lens holder (1) in a second direction (see annotated Figs. 1 and 6 above) that is perpendicular to the first direction. Kabasawa, Abstract, Table on p. 3, ¶44. Specifically, coil pair (8a,b) is positioned in the second direction (and so is coil pair (8c,d)). Mansuripur, ¶203.

f. 17[e]: "an inner yoke positioned on the base, the inner yoke positioned inside a cavity defined by each of the first coils, wherein the inner yoke has a pair of first walls disposed opposite the second coil and separated from each other in the second direction."

Kabasawa describes an inner yoke as yoke (14) positioned inside the cavity defined by focus coil (7a) and/or focus coil (7b) (first coils). Kabasawa, Table on p. 3, ¶49, Fig. 1. As annotated Figure 1 below shows, yoke (14) in each cavity has two walls (i.e., each green-highlighted element) that are opposite the tracking coils

(8a,b) and coils (8c,d) (second coil); the walls are separated from each other in the second direction, as annotated below. Mansuripur, ¶204.

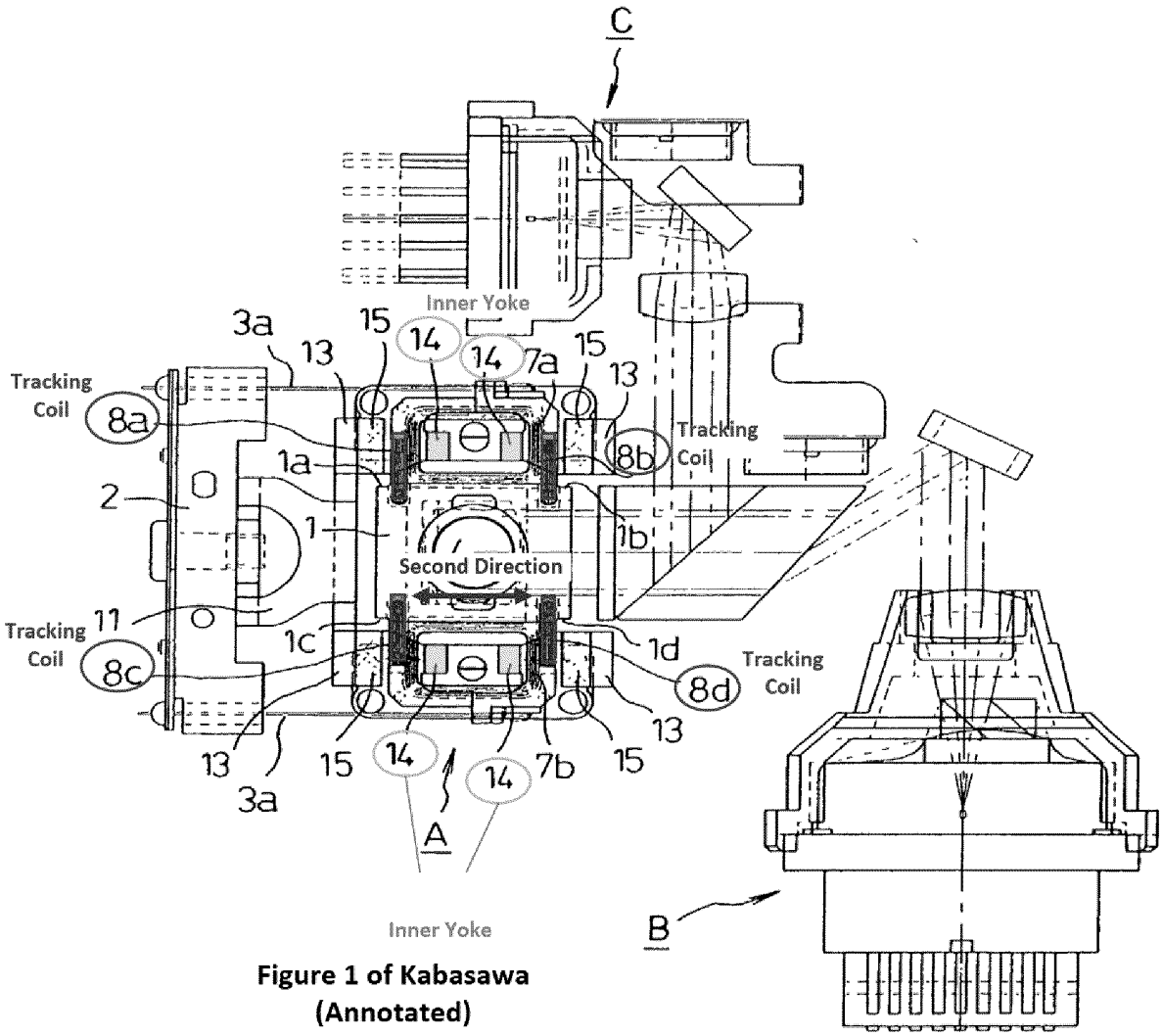


Figure 1 of Kabasawa (Annotated)

Alternatively, "a pair of first walls" can be construed by selecting one wall from each of the two green-highlighted inner yoke sections, as shown in the annotated Figure 1 below. The pair of first walls (highlighted in red) is disposed opposite the second coil (tracking coils (8c,d)) and the walls are separated from each other in the second direction. *Id.*, ¶205.

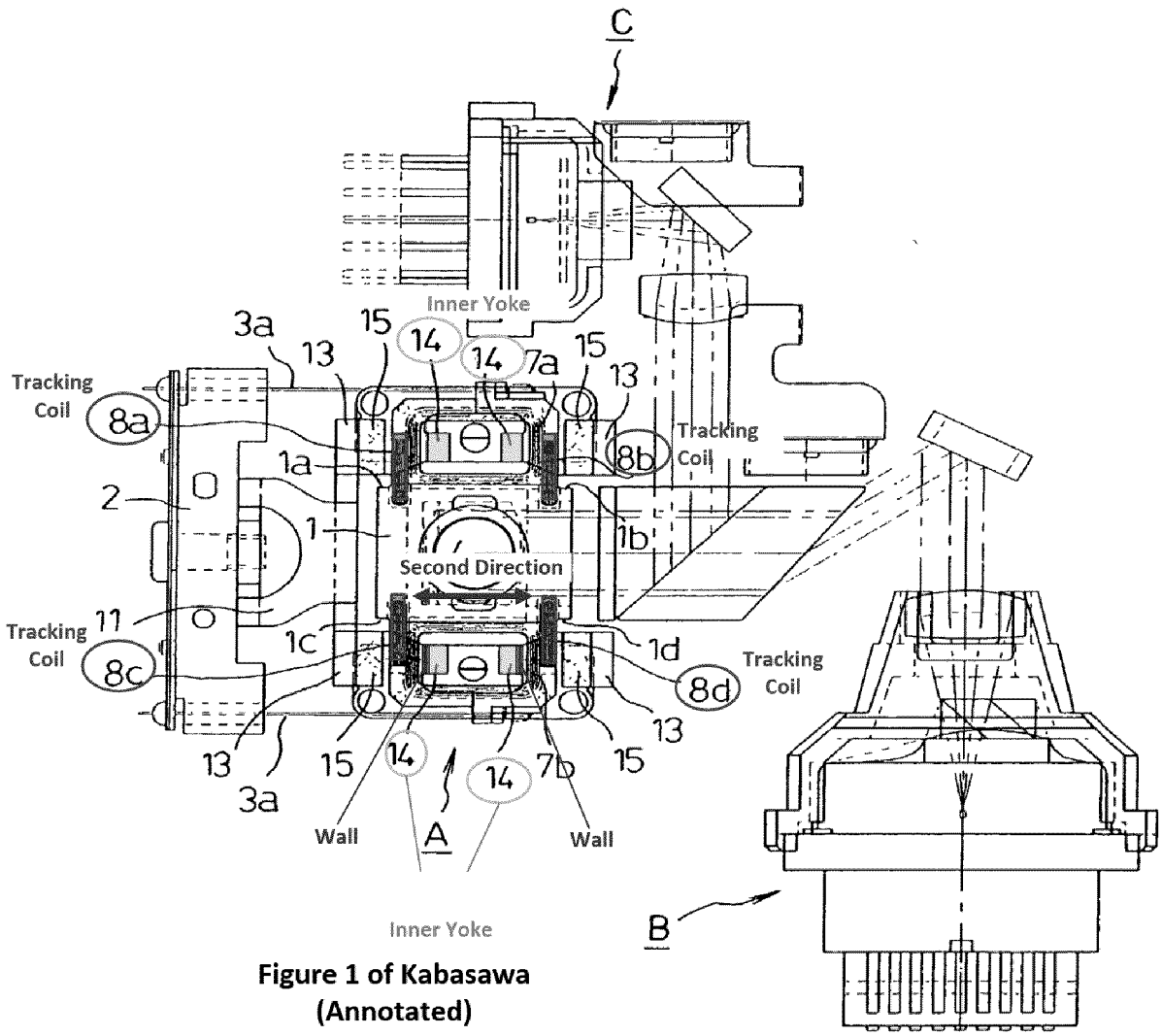


Figure 1 of Kabasawa (Annotated)

2. Claim 21: "…further comprising a pair of unipolar magnets disposed opposite each other with respect to the blade in the second direction and have the same polarity."

Kabasawa describes a pair of magnets (15) disposed opposite each other in the second direction–shown in annotated Figure 1 below. Kabasawa, Table on p. 3, ¶49, Fig. 1. Magnets (15) interact with focus coils (7a,b) and with tracking coils (8a-8d). Kabasawa, ¶49.

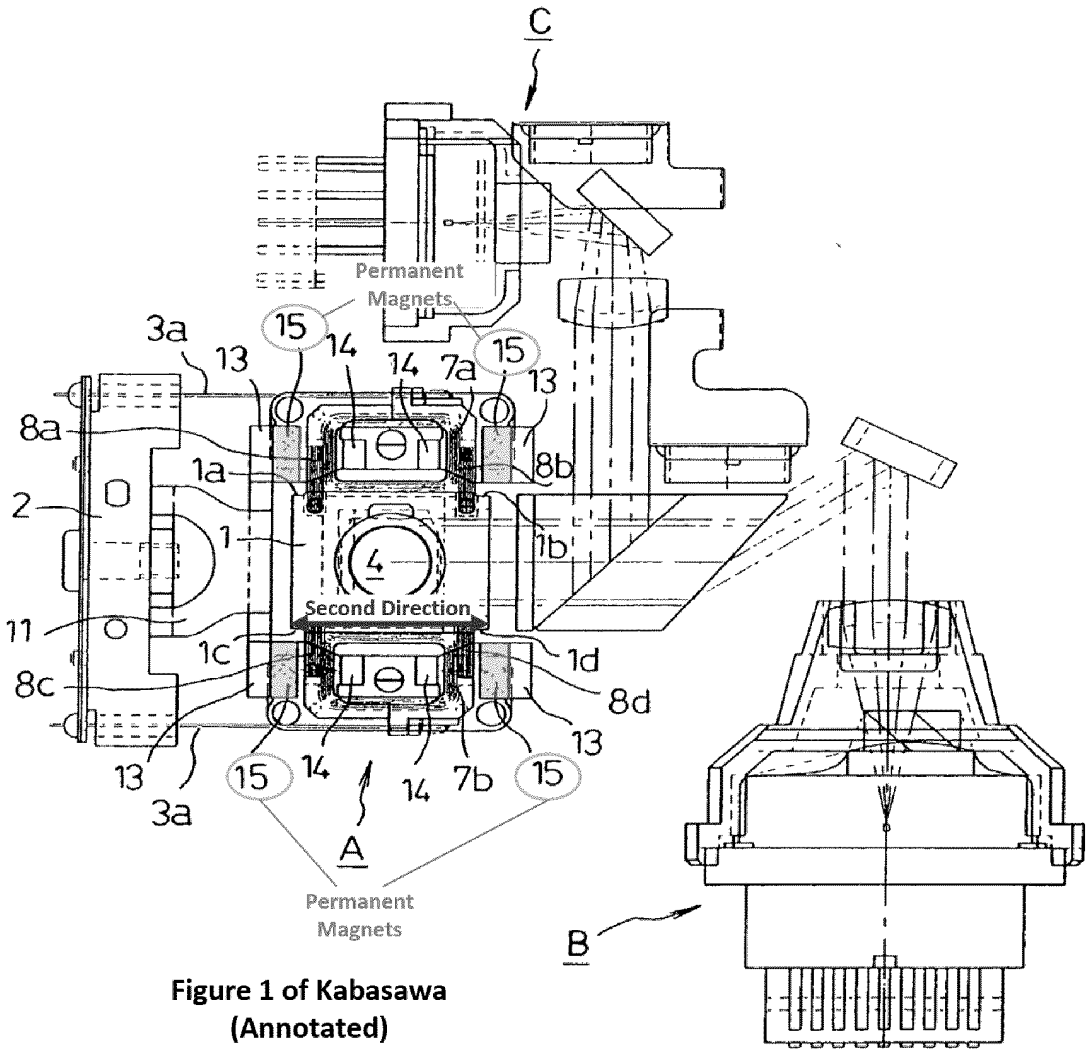


Figure 1 of Kabasawa (Annotated)

It would have been obvious to a POSITA that Kabasawa's magnets (15) were unipolar (i.e., had a single pole facing the focus and tilt coils) for the same reasons discussed in Ground 1. See Section V.A.6-7. Mansuripur, ¶¶206-207.

For example, it would have been obvious that the magnets interacted with focus coils (7a,b) in a unipolar fashion as explained in Ground 1, claim 7.

3. Claim 23: "…wherein the second coil is positioned vertically on both sides of the blade in the second [direction]."

Kabasawa discloses this claim because, as shown in Figure 1 (annotated below), coils (8a,b) (and similarly (8c,d)) are positioned vertically on both sides of the blade in the second direction. Kabasawa, Abstract, ¶¶44, 50, Fig. 1; s*ee also* Fig. 6 showing vertical positioning of tracking coils; Mansuripur, ¶¶208-209.

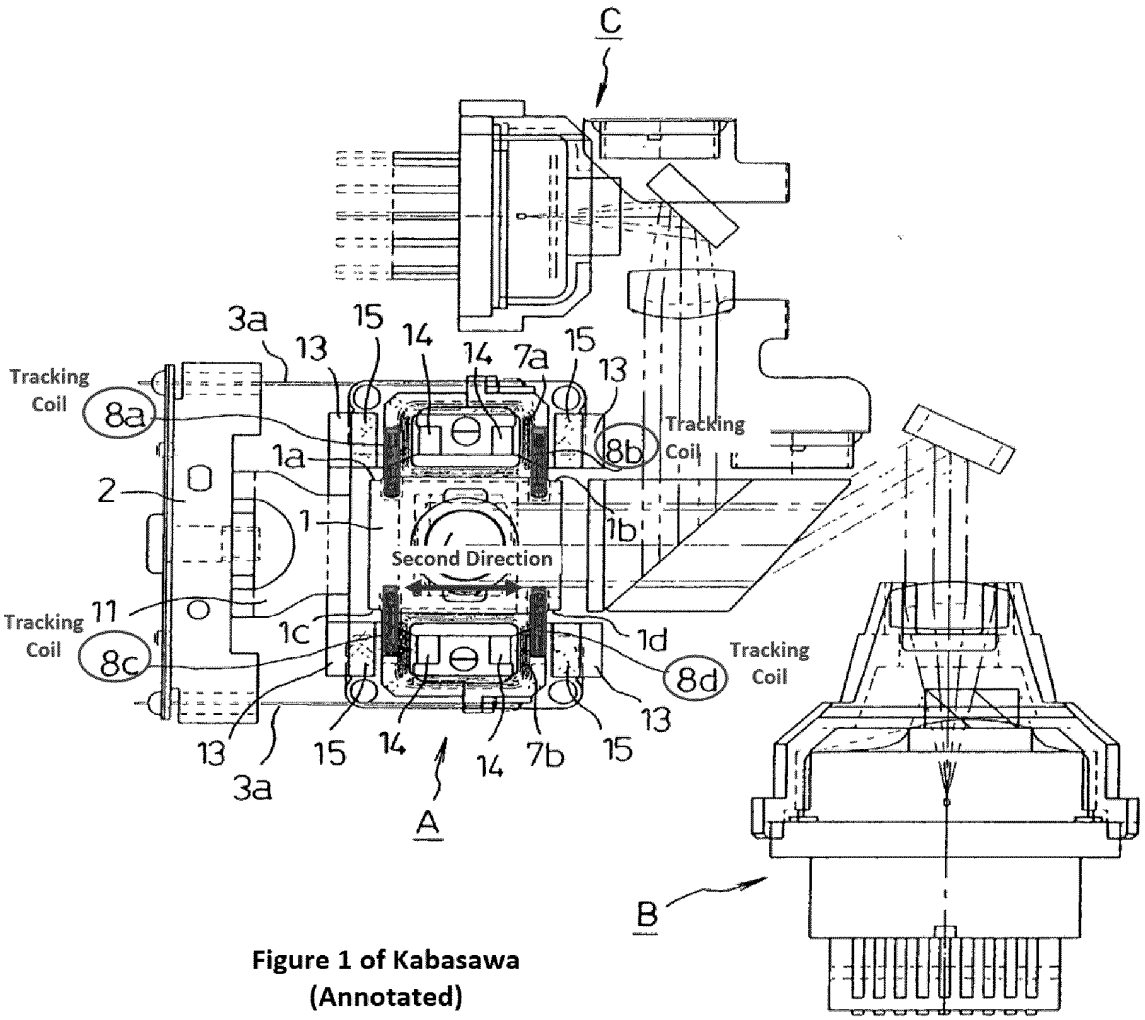
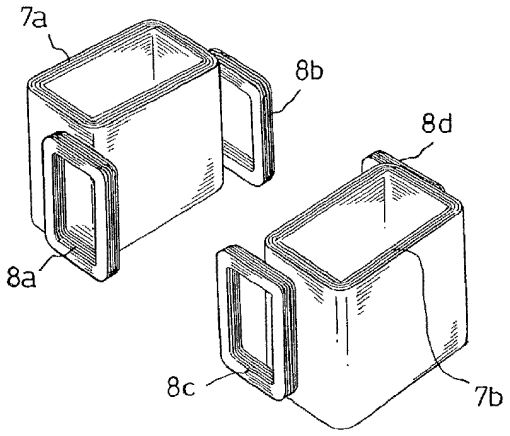


Figure 1 of Kabasawa (Annotated)

Fig. 6



4. Claim 24

a. 24[pre]: "An optical disc drive for a disc that is a recording medium, comprising:"

Kabasawa teaches or suggests this limitation because it describes an optical disk apparatus for reproducing/recording information in an optical disk recording medium, such as a CD. Kabasawa, ¶¶2, 4 - 5, 20, 33, Fig. 1; Mansuripur, ¶210.

b. 24[a]: "a spindle motor for rotating the disc;"

Kabasawa teaches or suggests a spindle motor for rotating the disc because it describes a "rapidly rotating" optical disk, wherein light beams reflected from the recorded pits on the disk are detected to read those recorded bits. Kabasawa, ¶¶5-8. It would have been obvious to a POSITA that a spindle motor would be used to rotate the disc because a spindle motor was a routine and known element for causing a disk to rotate in a disk drive. Additionally, a spindle motor for rotating the

disc is AAPA and was described in the '055 patent as part of prior art systems. Ex. 1001, 1:21-26; 3:5-8; Mansuripur, ¶211.

c. 24[b]: "an optical pickup for recording and/or reproducing information by emitting light focuses onto the disc through an objective lens; and;"

Kabasawa teaches or suggests an optical pickup for recording and/or reproducing information because it describes an "***optical pickup apparatus***" including various optical components for recording/reproducing information on optical storage media through an objective lens. Kabasawa, Abstract, ¶¶33, 43, Fig. 1; *see also* Element 24[pre]. Kabasawa's objective lens (4) (see Element 17[b], *supra*) transmits light to the optical disc. *Id.*, ¶¶5-8, 20, 26, 43; Fig. 1. Therefore, Kabasawa teaches or suggests the claimed optical pickup and objective lens similar to the '055 patent's description. See, Ex. 1001, 6:6-11. It would have been obvious that the objective lens focuses the light onto the recorded medium because Kabasawa describes focusing coils and other techniques for improving "focus characteristics." Kabasawa., ¶56; *see also*, *id.*, ¶¶17, 44. Additionally, this limitation is obvious as an AAPA. *See* Ex. 1001, 1:20-46; Mansuripur, ¶¶212-214.

d. 24[c]: "an optical pickup actuator for controlling a position of the objective lens so that the emitted light is focused on a desired

position of the disc, the optical pickup actuator comprising:"

Kabasawa describes an optical pickup actuator as explained in Element 17[pre], *supra*. Kabasawa's objective lens focuses the light on a desired position of the disc, as explained in Element 24[b]; Mansuripur, ¶215.

e. 24[d]: "a blade holding the objective lens and supported on a base by a plurality of suspension wires so that the blade is elastically movable,"

See Elements 17[a], 17[b], *supra*.

f. 24[e]: "a pair of first coils positioned horizontally on the blade and disposed opposite each other with respect to the objective lens in a first direction,"

See Element 17[c], *supra*.

g. 24[f]: "a second coil positioned vertically on a side of the blade in a second direction perpendicular to the first direction, and"

See Element 17[d], *supra*.

h. 24[g]: "an inner yoke positioned on the base, the inner yoke positioned inside a cavity formed by walls of each of the first coils, wherein the inner yoke has a pair of first walls disposed opposite the second coil and separated from each other in the second direction."

See Element 17[e], *supra*.

5. Claim 28: "The optical disc drive according to claim 24, wherein the optical pickup actuator further comprises a pair of unipolar magnets disposed opposite to each other with respect to the blade in the second direction and have the same polarity."

See Claim 21, *supra*.

I. Ground 9: Miura, Alone or in View of AAPA, Combined with

Kamata Renders Obvious Claims 17, 19, 23-24 and 26

Miura strives to make the "whole optical pickup of an optical disk drive thinner while maintaining an excellent dynamic characteristic of an object lens driving device." Miura, Abstract. Miura's optical pickup apparatus includes an objective lens (1), two focus coils (3), tracking coils (4), tilt coil (9), and inner yokes (50b, 51b). *Id.*, Abstract, 233-234, Figs. 5-6; Mansuripur, ¶221.

1. Claim 17

a. 17[pre]

Miura describes an optical pickup actuator (see Figures 5, 6 annotated below) that includes a tilting coil (9) for tilting objective lens (1), and magnets (6c,d) for generating magnetic flux acting on tilting coil (9) arranged on the fixed section (base). Miura, 293-297; Mansuripur, ¶222.

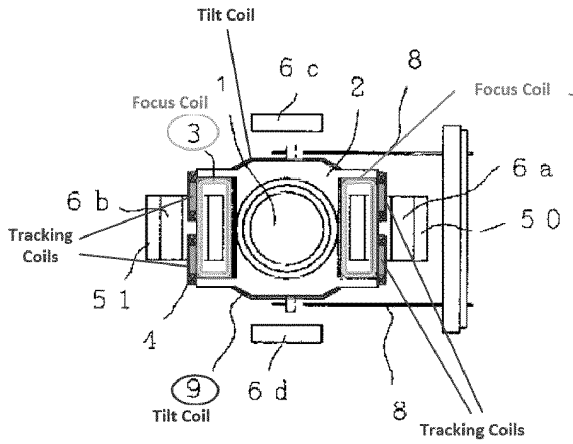


Figure 5 of Miura (annotated)

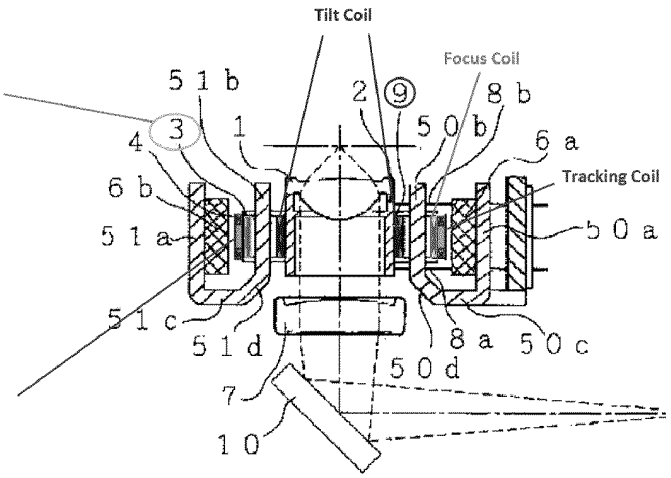


Figure 6 of Miura (annotated)

b. 17[a]

Miura describes a blade as lens holder (2) holding an objective lens (1). Miura, claim 1, Fig. 5 (annotated below); Mansuripur, ¶¶, 49-50, 223. *See also* Element 1[a] in Ground 1 for discussion of terms blade and lens holder.

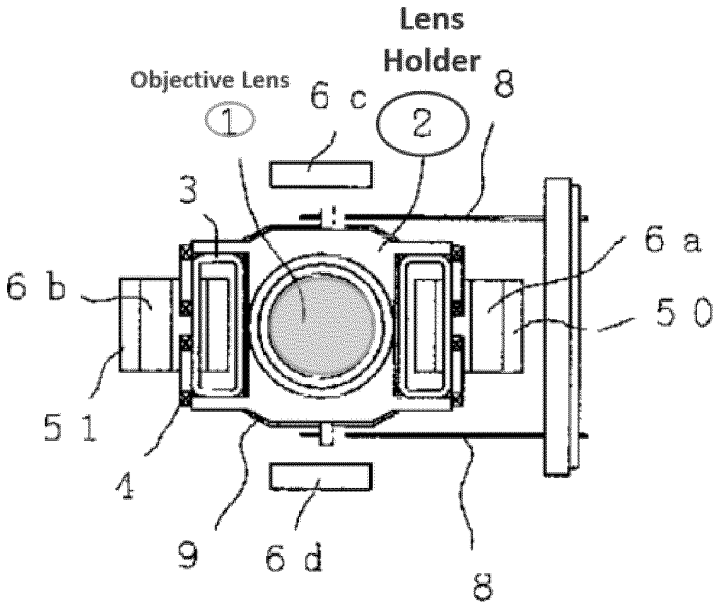


Figure 5 of Miura (annotated)

5

c. 17[b]

Miura describes a plurality of suspension wires as elastic support members (8) (see annotated Fig. 5 below) that make the blade elastically movable. Miura, 220-223; see also, *id*., 32-33; Mansuripur, ¶224.

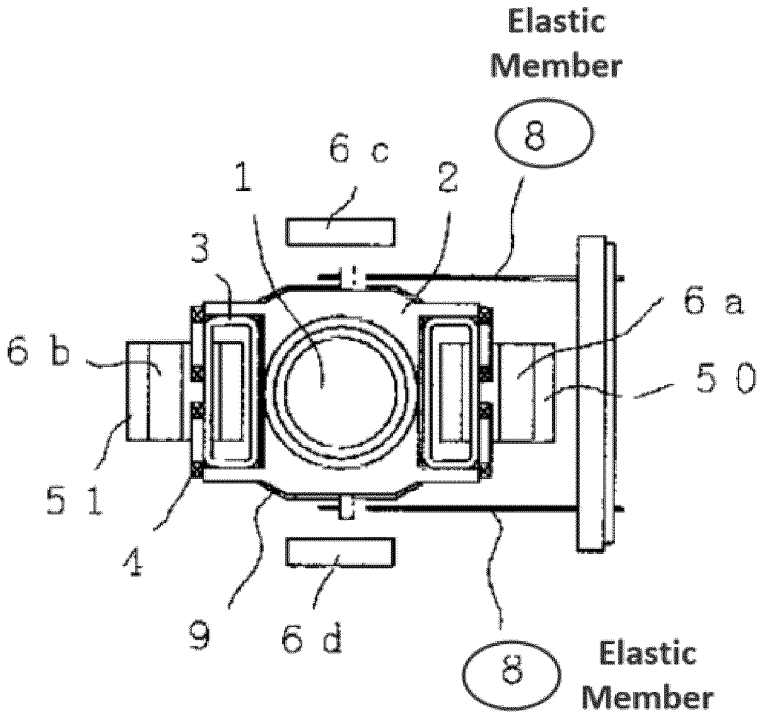


Figure 5 of Miura (annotated)

d. 17[c]

Miura describes a pair of first coils as focus coils (3) initially described in connection with Figure 1, and also illustrated in Figures 5 and 6. *See* Miura, 339; *see also*, *id*., 220. As Figure 5 (below) shows, focus coils (3) (pair of first coils) are positioned horizontally on the blade, opposite each other with respect to objective lens (1) in a first direction. Mansuripur, ¶225. *See also* Ground 1, Element 1[d], for explanation of "horizontal" configuration of coils.

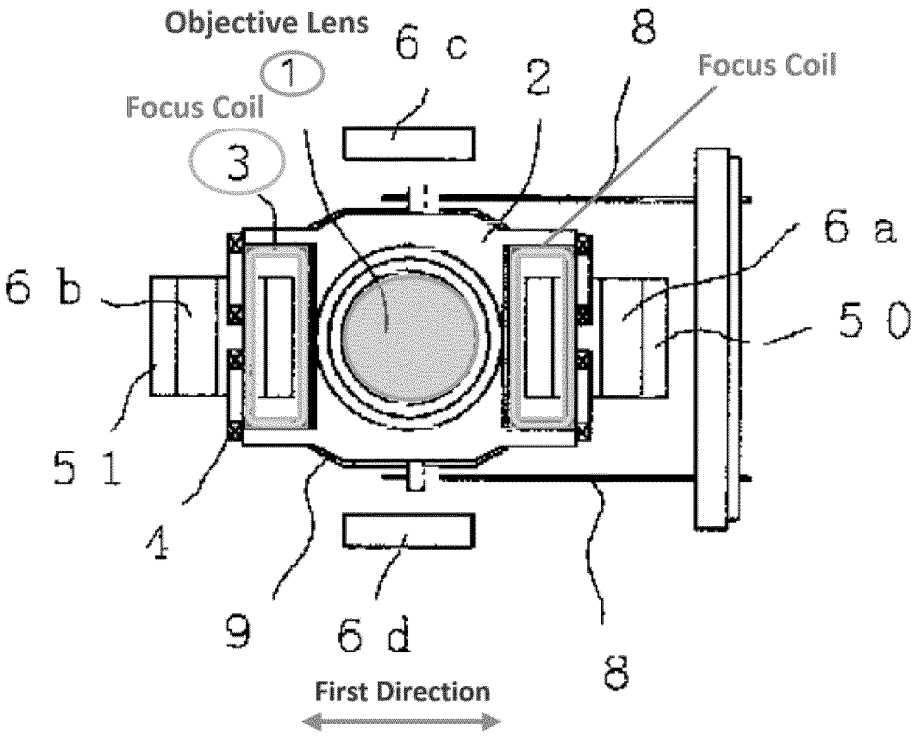


Figure 5 of Miura (annotated)

e. 17[d]

Miura describes a second coil as tracking coils (4) (see annotated Figs. 5 and 6 below). The two tracking coils (4) on the left side of lens holder (1) are construed as the second coil positioned vertically on the (left side of) lens holder (blade) and positioned in the second direction perpendicular to the first direction. Additionally, or alternatively, the tracking coils on the right of lens holder (1) can be construed as the claimed second coil. Mansuripur, ¶226.

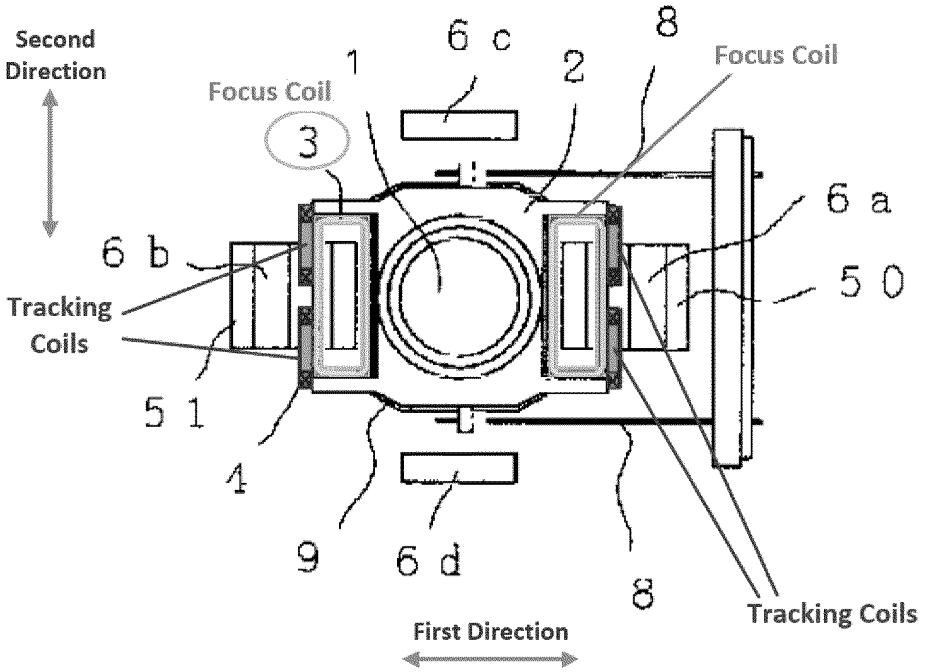


Figure 5 of Miura (annotated)

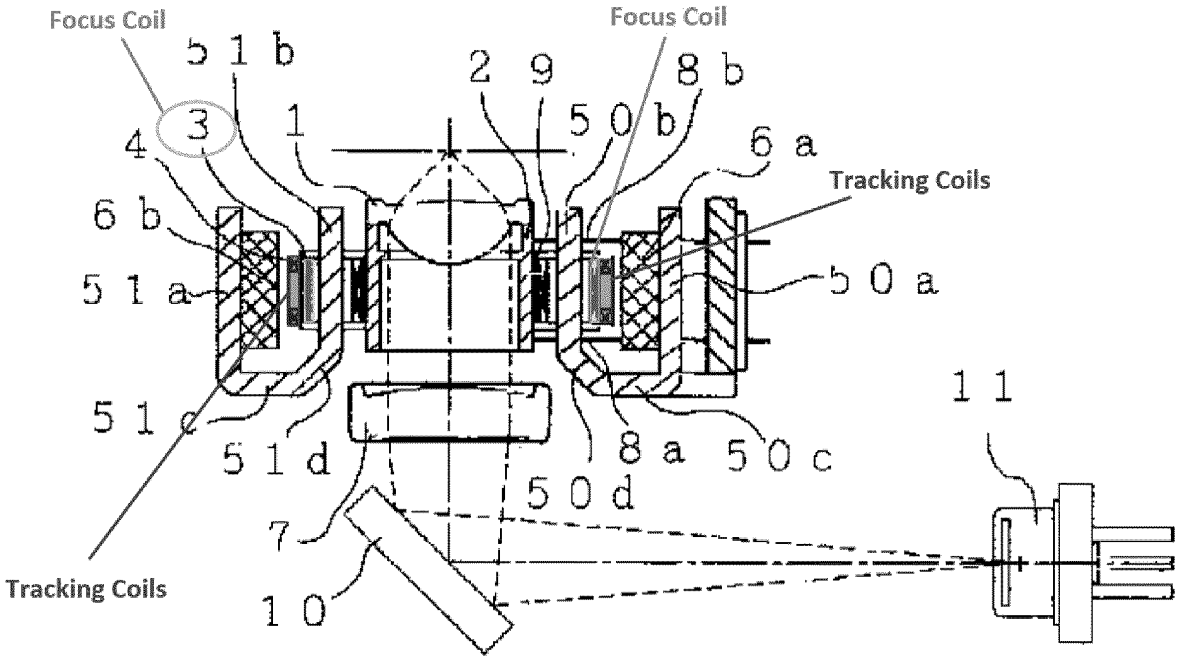


Figure 6 of Miura (annotated)

f. 17[e]

Miura describes an inner yoke as yokes (50b) and/or (51b) positioned inside the cavity defined by each of the focus coils 3 (first coils) (see annotated Figures 5 and 6 below). *See also*, Miura, 298-299, and Abstract (explaining internal yokes (50b,51b) having walls extending in the direction of the objective lens's optical axis).

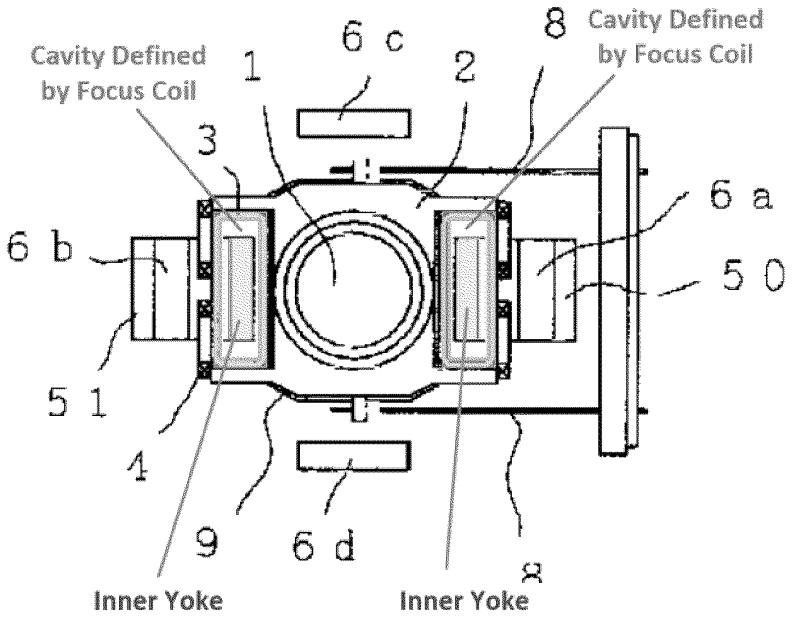


Figure 5 of Miura (annotated)

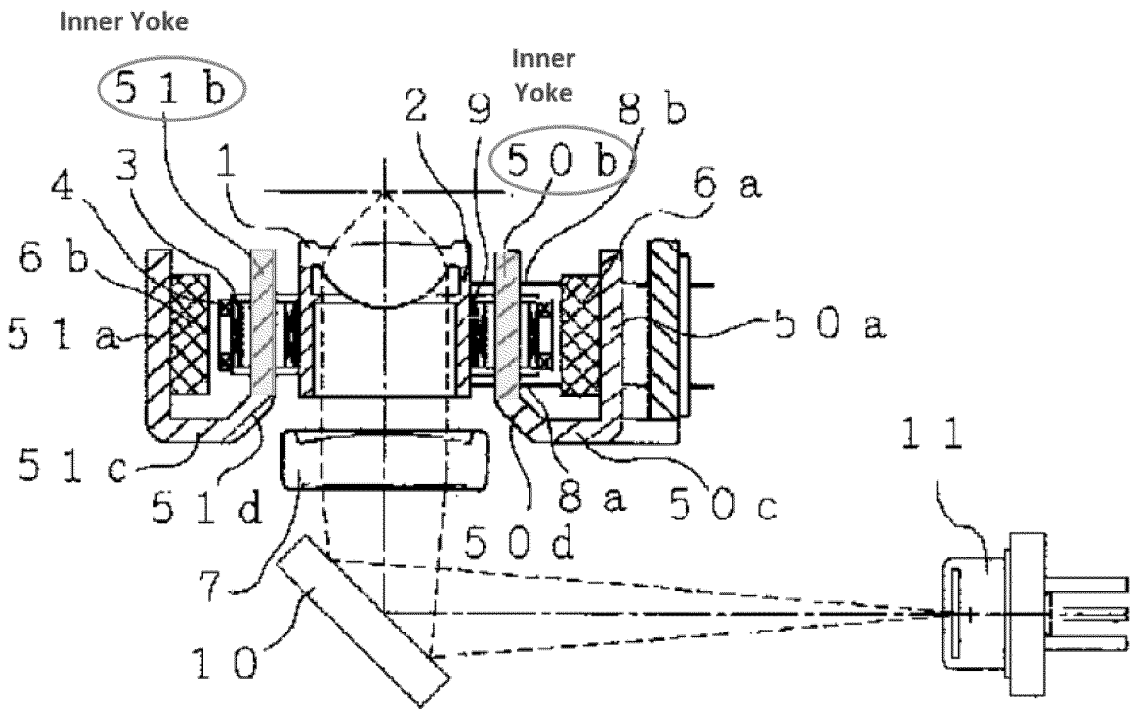


Figure 6 of Miura (annotated)

Miura's inner yoke arguably includes a pair of first walls that are disposed opposite the second coil (tracking coils 4) and are separated in the second direction (see annotated Fig. 5 of Miura below).

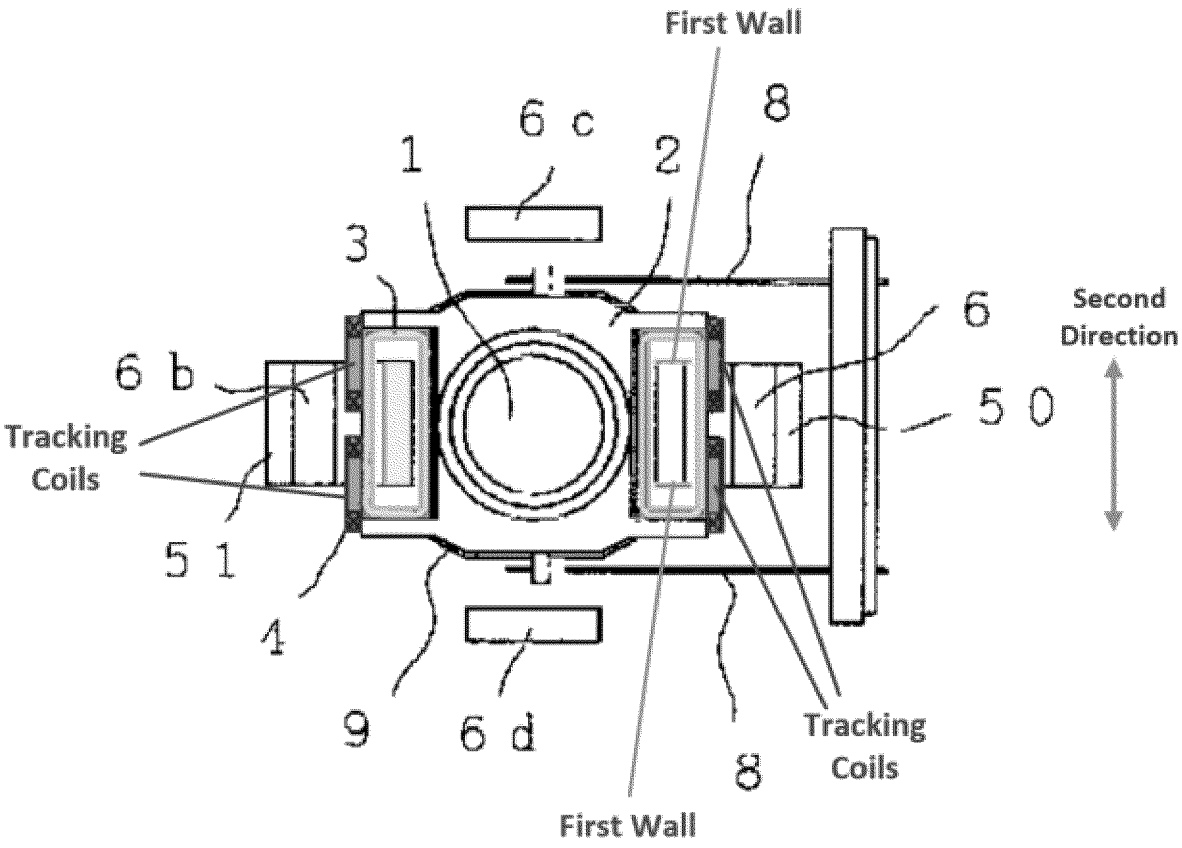


Figure 5 of Miura (annotated)

Notably, during the prosecution of the '055 patent, the examiner relied on Japanese Patent 2002-140828 ("JP-828") to reject the then-pending claim 6 that recited an inner yoke with a pair of first walls. Ex. 1011, 169. JP-828 shows an inner yoke 7 in its Figure 21 (annotated below). *Id.*, 205. The examiner rejected claim 6 based on elements 5 (magnet) and Element 7 (yoke) of JP-828. *Id.*, 169. If the Board agrees with the examiner's interpretation, Miura's inner yoke, as shown above, included a pair of first walls like JP-828.

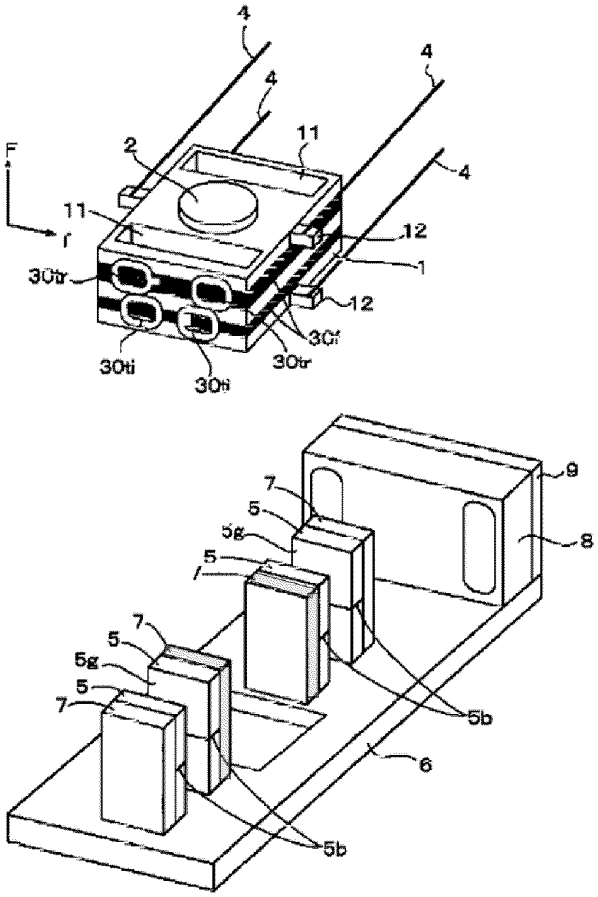


Figure 21 of JP2002-140828 (annotated)

Otherwise, this limitation would have been obvious based on the Miura-Kamata combination. As explained in Ground 7, Kamata's optical pickup actuator includes "a magnet and a yoke having opposing surfaces facing each other with the focus coil and tracking coil therebetween." Kamata, 36-37; *see also* Fig. 2 (annotated below).

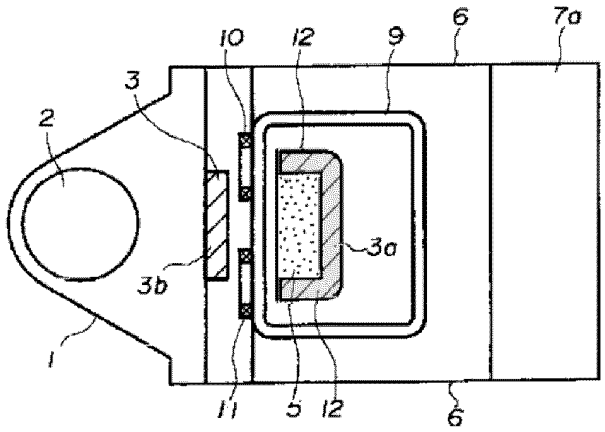


Figure 2 of Kamata (annotated)

Kamata overcomes the shortcomings of prior systems (*id.*, 68-71) by using a yoke with two bent sections (see Fig. 2) that "reduce the magnetic flux directed obliquely from the permanent magnet 5 to both the tracking coils 10 and 11." *Id.*, 121-124. Accordingly, a more uniform magnetic field density around the tracking coils is generated, and undesirable rotational movements of the lens holder are eliminated. *Id.*, 153-155; *see also*, *id.*, 89-90.

In the combination, a POSITA would have found it obvious to replace Miura's inner yoke with Kamata's inner yoke having bent side walls. The inner yoke would have included a pair of first walls separated in the second direction (see below illustration). Mansuripur, ¶¶227-231.

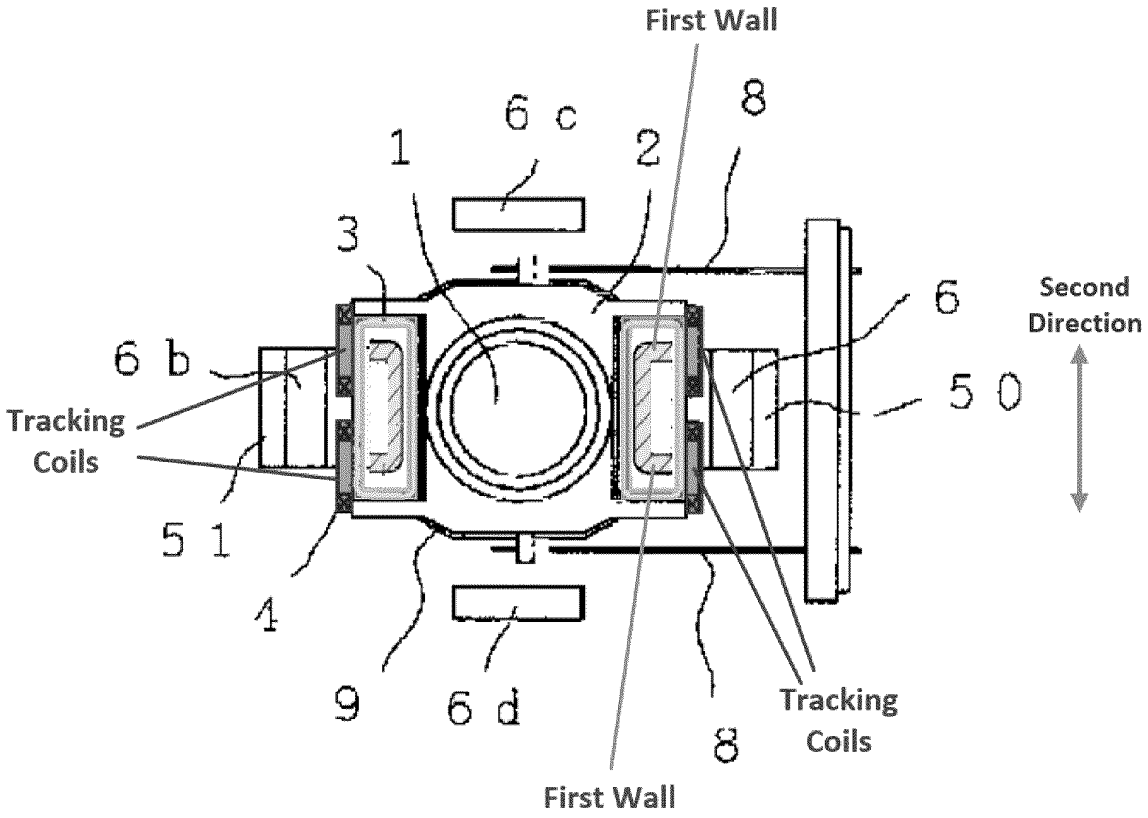


Illustration - Figure 5 of Miura Combined with Inner Yoke of Kamata

A POSITA would have been motivated to make this combination because Kamata had recognized a problem in prior systems that used two adjacent tracking coils (e.g., those in Kamata's Figure 7; also in Miura's Figure 5) that generated an unbalanced magnetic field around the tracking coils. *Id.*, 68-71. And Kamata proposed a solution by adding two bent sections to its inner yoke (see Fig. 2) to produce a uniform field around the tracking coils and remove the undesirable rotational movements. Kamata, 89-90, 121-124, 153-155. Therefore, a POSITA would have been motivated to augment the optical pickup of Miura by

incorporating an inner yoke with two bent sections, as taught by Kamata, to improve the magnetic field uniformity of Miura's tracking coils and improve the operation of the optical pickup. Mansuripur, ¶232.

Making the modifications involved routine mechanical modifications that were well within the capabilities of a POSITA. *Id.*, ¶233.

2. Claim 24

a. 24[pre]

Miura teaches or suggests the preamble because it describes an "an objective lens drive apparatus used in an optical disc apparatus" (Miura, 93-94), where objective lens "concentrates an optical beam on an optical disc." *Id.*, 29. Miura's optical beam spot is focused by objective lens (1) on the optical disc's ***recording surface*** track (*id.*, 252-253), conveying to a POSITA that Miura's optical pickup is for a recording medium (optical disc). Mansuripur, ¶234.

b. 24[a]

Miura teaches or suggests this limitation because it describes tracking coils in an optical disc drive (Miura, 249-253), thus conveying to a POSITA that tracking the recorded information on a rotating disk would be needed, and a spindle motor would have been an obvious and known element for rotating such a disk. Mansuripur, ¶235. Additionally, a spindle motor is AAPA and was described in

the '055 patent as part of prior art systems. Ex. 1001, 1:21-26; 3:5-8. Mansuripur, ¶235.

c. 24[b]

Miura teaches or suggests an optical pickup because Miura strives to "provide an objective lens drive apparatus that is capable of making the entire ***optical pickup*** thinner." Miura, 15-16; *see also*, *id.*, 121-122. Miura also describes an objective lens (1) (see Element 17[b], *supra*) that "concentrates an optical beam on an optical disc" (*id.*, 29, 252-253), conveying to a POSITA that Miura's optical pickup is for recording/reproducing information via the focused light. Therefore, Miura teaches or suggests the claimed optical pick and objective lens similar to the '055 patent's description. See, Ex. 1001, 6:6-11. Additionally, this limitation is obvious as AAPA. *See Id.*, 1:20-46. Mansuripur, ¶236.

d. 24[c]

See Element 17[pre], *supra*.

e. 24[d]

See Elements 17[a], 17[b], *supra*.

f. 24[e]-24[g]

See Element 17[c]-17[e], respectively.

3. Claims 19/26: "…further comprising a third coil positioned

so as to surround the sides of the blade."

Miura describes a third coil as tilt coil (9). See Figs. 5, 6 below. The combination with Kamata does not affect the placement of Miura's tilt coil, and thus original Figures of Miura are used to illustrate the tilt coil's position.

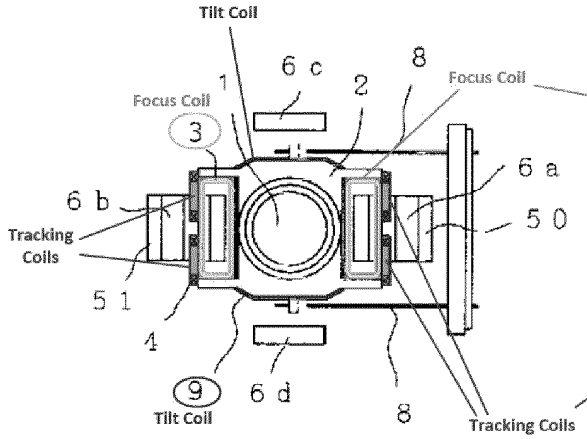


Figure 5 of Miura (annotated)

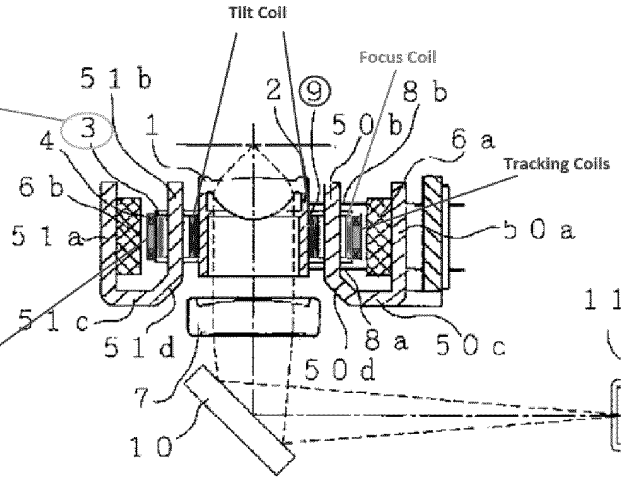


Figure 6 of Miura (annotated)

A POSITA would have found it obvious that Miura's tilt coil (9) surrounds the sides of the blade because the tilt coil very clearly surrounds the top and bottom sides ("the sides") of the lens holder (blade) (annotated in red below).

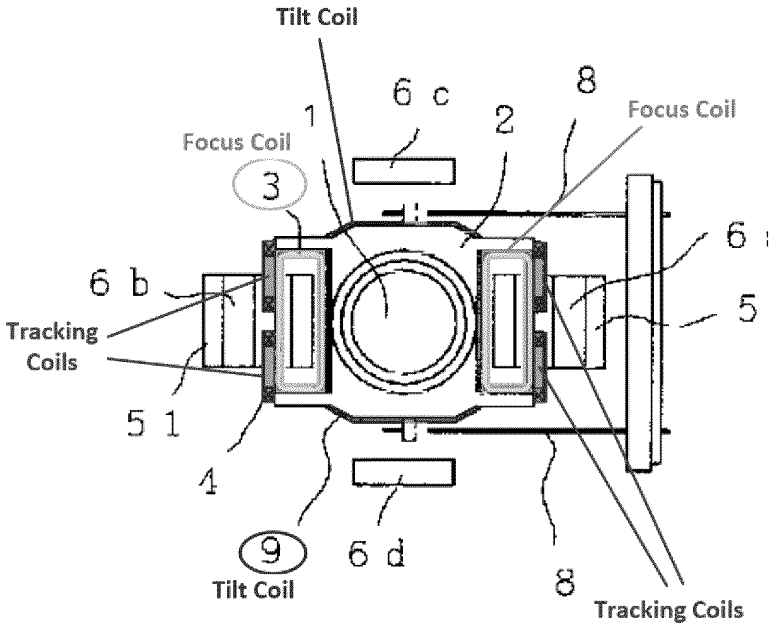


Figure 5 of Miura
(annotated)

Additionally, Miura's Figure 6 (annotated below) shows a front ***cross-sectional view*** (Miura, 294-295), where all three coil types (focus (3), tracking (4) and tilt (9)) are visible. A POSITA would have found it obvious that tilt coil (9) fully wraps around the lens holder because otherwise it would not have been visible in the cross-sectional view of Figure 6; and because a continuous loop of wire wrapping around the lens holder would be needed, otherwise it cannot carry the electric current. Mansuripur, ¶¶242-244.

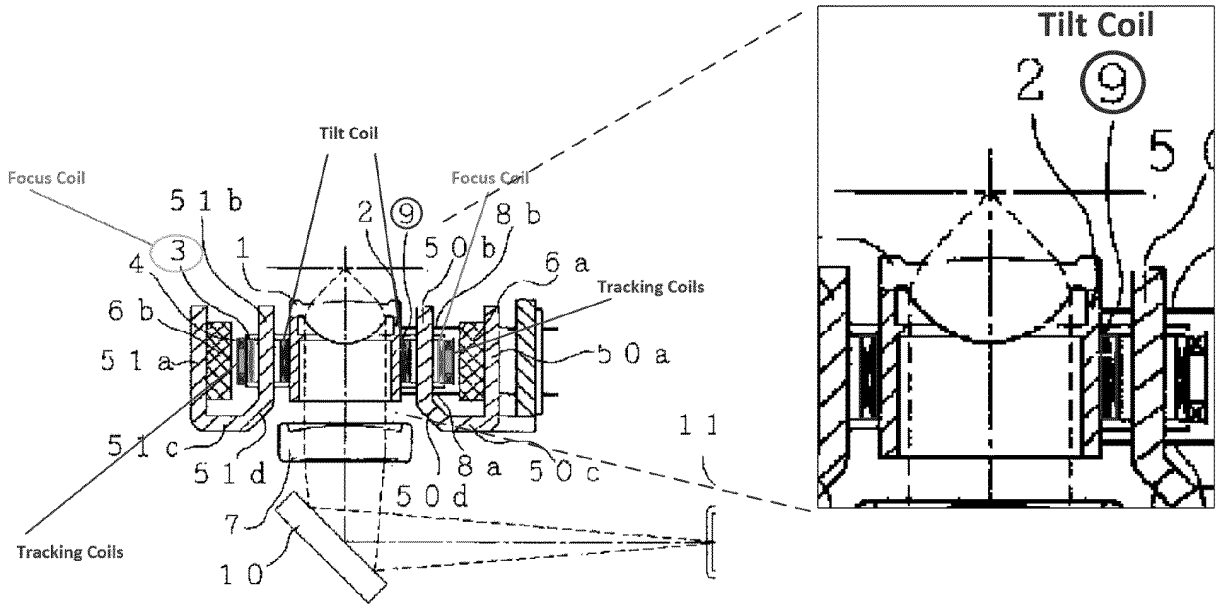


Figure 6 of Miura (annotated)

4. Claim 23

Miura discloses this claim in its Figure 6 (above) and Figure 5 (annotated below), where one pair of tracking coils (4) (second coils) are positioned vertically on two (both) sides of the lens holder (1) (blade) in the second direction. Specifically, the two tracking coils on the left side are placed vertically and are separated in the second direction, and the two tracking coils on the right side are placed vertically and are separated in the second direction. The combination with Kamata does not affect the placement of the tracking coils, and thus Miura's original Figure 5 is used to illustrate the tracking coils' position. Mansuripur, ¶245.

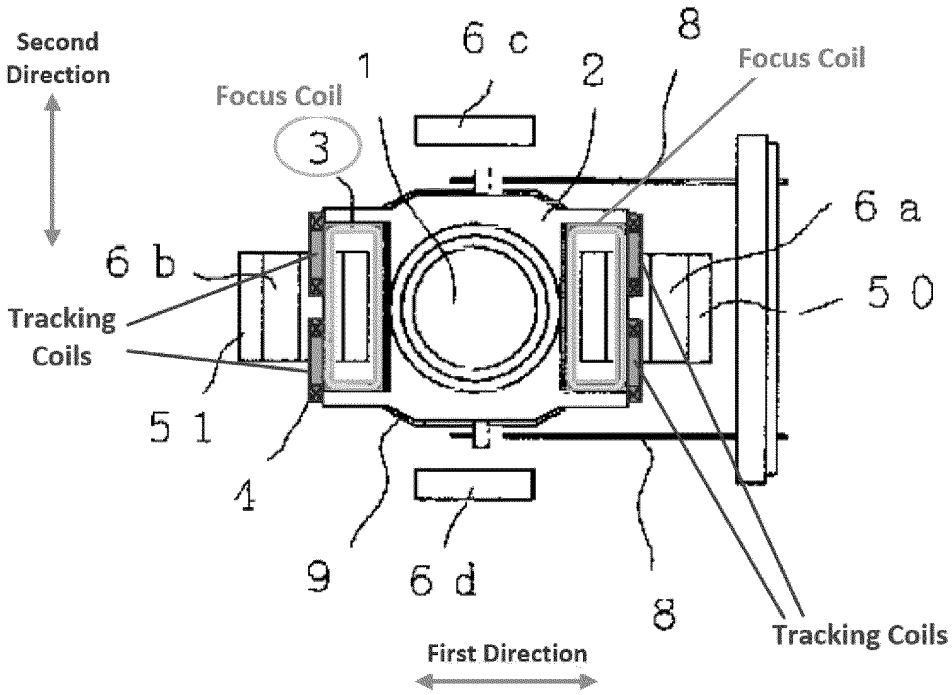


Figure 5 of Miura (annotated)

J. Ground 10: Sugiyama, Alone or in Combination with AAPA, Renders Obvious Claims 1, 3-4, 10, and 12-13.

Sugiyama relates to an objective lens-driving device for reading/writing information on an optical disk. Sugiyama, Abstract. Sugiyama's device includes "an objective lens 4, a focusing coil 6, a tracking coil 7, and a lens holder 5, a fixed section 8 that supports the movable section by means of elastic support members 9." *Id.*, Fig. 1; Mansuripur, ¶246.

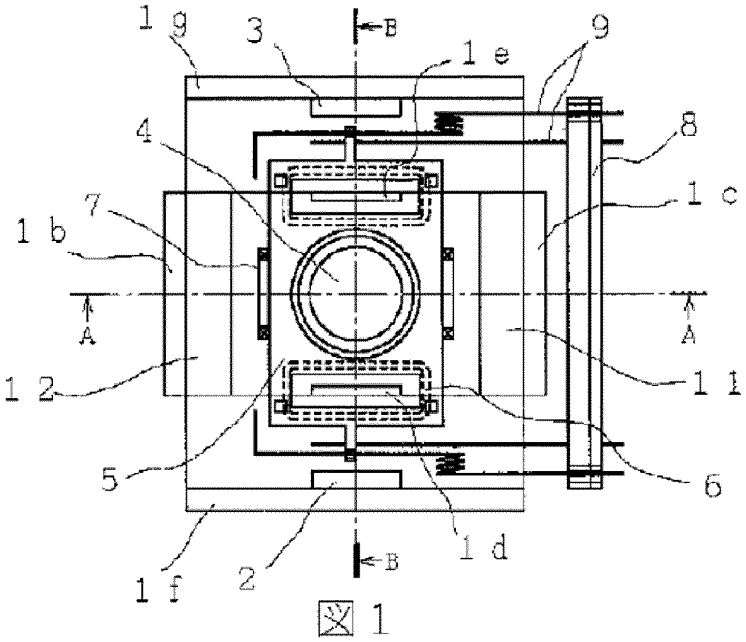


Figure 1 of Sugiyama

1. Claim 1

a. 1[pre]

Sugiyama describes an optical pickup actuator because it describes "an objective lens drive for use in an optical disc device" that includes a base (1a) and accommodates an objective lens (4) (Sugiyama, 93, 183-193; Figs. 1, 2–annotated below), which moves in the tracking, focusing and tilt directions due to the force generated by the respective coils. *Id.*, 28-35, 147-158; Mansuripur, ¶247.

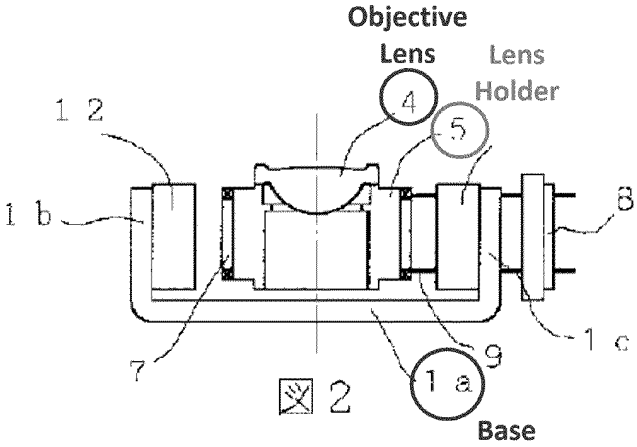


Figure 2 of Sugiyama (annotated)

b. 1[a]

Sugiyama discloses a blade as a lens holder (5), accommodating an objective lens (4). Sugiyama, 17-18, 148-149, 151-152; Fig. 1 (annotated below), Fig. 2 (annotated above); Mansuripur, ¶248.

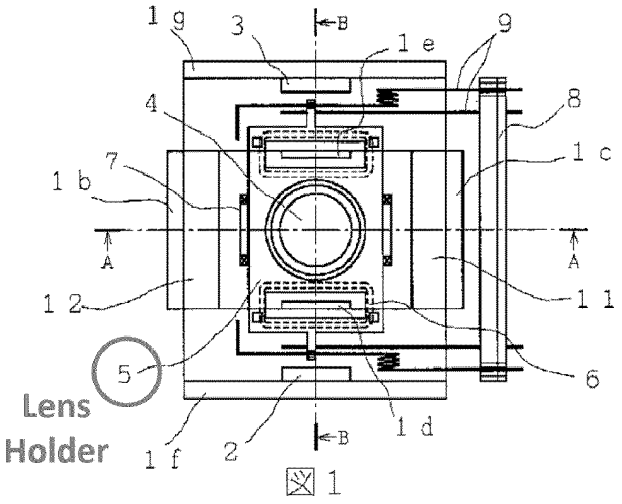


Figure 1 of Sugiyama (annotated)

c. 1[b]

Sugiyama discloses this element as a plurality of elastic support members (9) supporting the movable part (lens holder/blade) on base (1a). Sugiyama, 152-154, *see also* Figs. 1, 2 (annotated below), *id.*, 207-212; Mansuripur, ¶249.

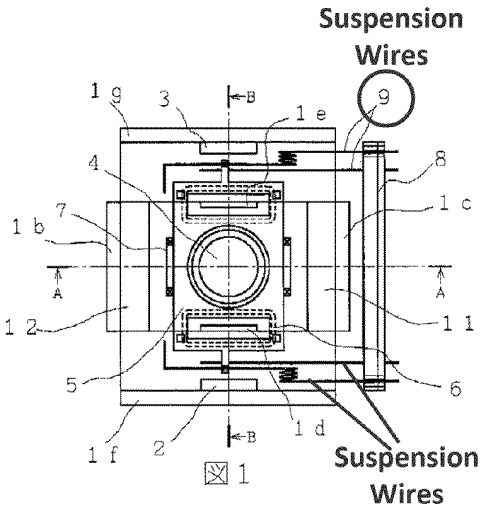


Figure 1 of Sugiyama (annotated)

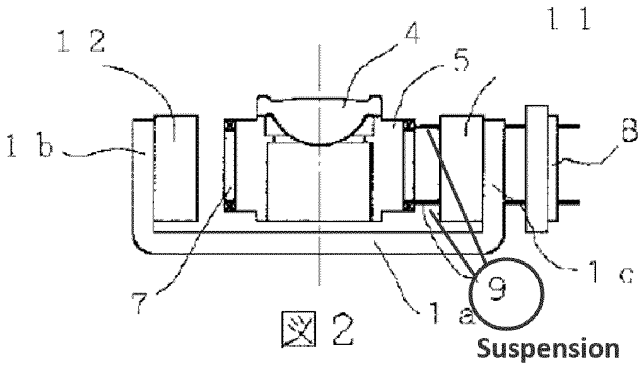


Figure 2 of Sugiyama (annotated)

d. 1[c]

Sugiyama discloses this element as four magnetic elements (2, 3, 11, 12) positioned on base (1a) (on yokes of the base). Sugiyama, 201-203; *see also*, Figures 1 and 2. All magnetic Elements (2, 3, 11, 12) can be construed as the magnetic element. However, Element 1[d] only requires interactions with magnetic elements (2) and (3), as explained below.[13] Mansuripur, ¶250.

[13] Dependent claim 3 further requires interactions with magnetic elements (11, 12).

e. 1[d]

Sugiyama discloses this limitation as two focus coils (6) and two tilt coils (13) positioned on the blade. Sugiyama, 191-195, Figs. 1, 3 (annotated below).

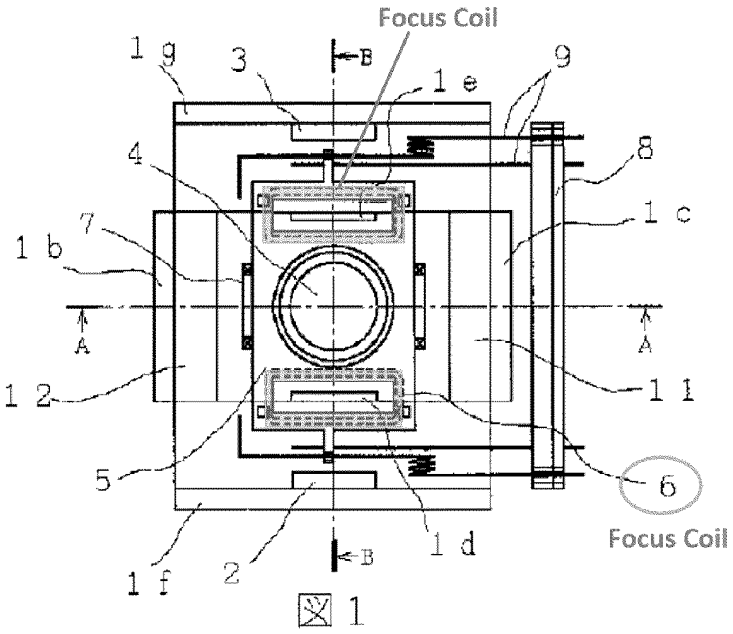


Figure 1 of Sugiyama (annotated)

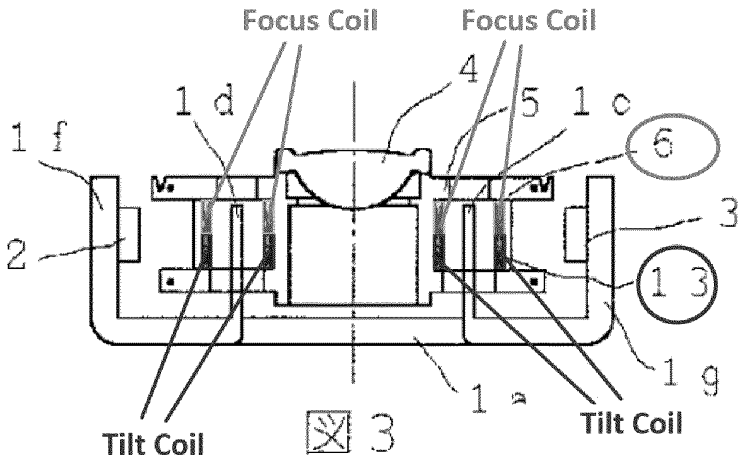


Figure 3 of Sugiyama (annotated)

Sugiyama's focus and tilt coils are positioned horizontally on the blade because they are positioned on the blade, with windings parallel to the blade's top surface. See Ground 1, Element 1[d], *supra*.

Sugiyama's teaches or suggests focus (6) and tilt (13) coils interact with magnetic elements (2) and (3) to generate an electromagnetic force because focus (6) and tilt (13) coils are positioned across from magnetic elements (2) and (3). See Sugiyama, Figs. 1, 3. Sugiyama also explains "…the signal from ***the tilt drive circuit supplies an adequate tilt current to tilting coil 13,*** making it possible to tilt the movable section." *Id.*, 237-240; *see also*, *id.*, 229-230. Mansuripur, ¶¶251-253.

f. 1[e]

Sugiyama's coil is divided into subcoils: focus coil (6) and tilt coil (13) that are vertically separated. Sugiyama, 191-195: "A set of ***focusing coils 6*** is arranged symmetrically around the center of objective lens 4 … In addition, ***below said focusing coils 6, tilting coil 13, with a winding axis approximately coaxial with focusing coil 6, is adjacently arranged***." *See also*, *id.*, Fig. 3 (annotated below). Accordingly, each focus subcoil is vertically separated from an adjacent tilt subcoil, and vice versa. Mansuripur, ¶254.

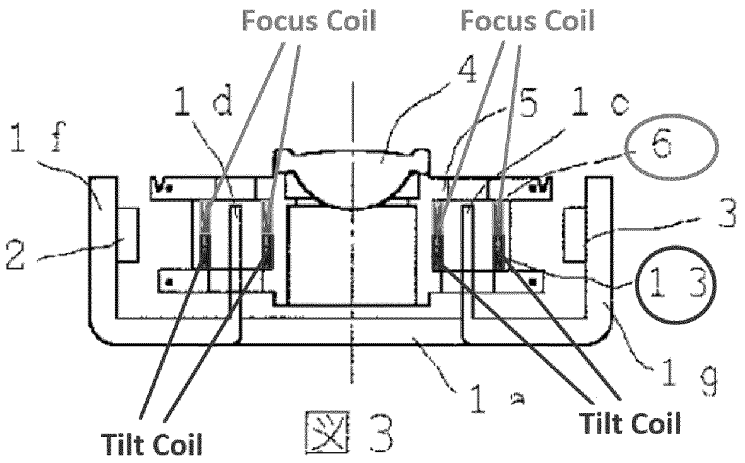


Figure 3 of Sugiyama (annotated)

g. 1[f]

Sugiyama's coil includes a first pair of coils: a pair of focus coils (6), positioned on lens holder (5) in a first direction facing each other with respect to the

objective lens (4), as shown in Figure 1 (annotated below); *see also*, Sugiyama, 191-192. Mansuripur, ¶255.

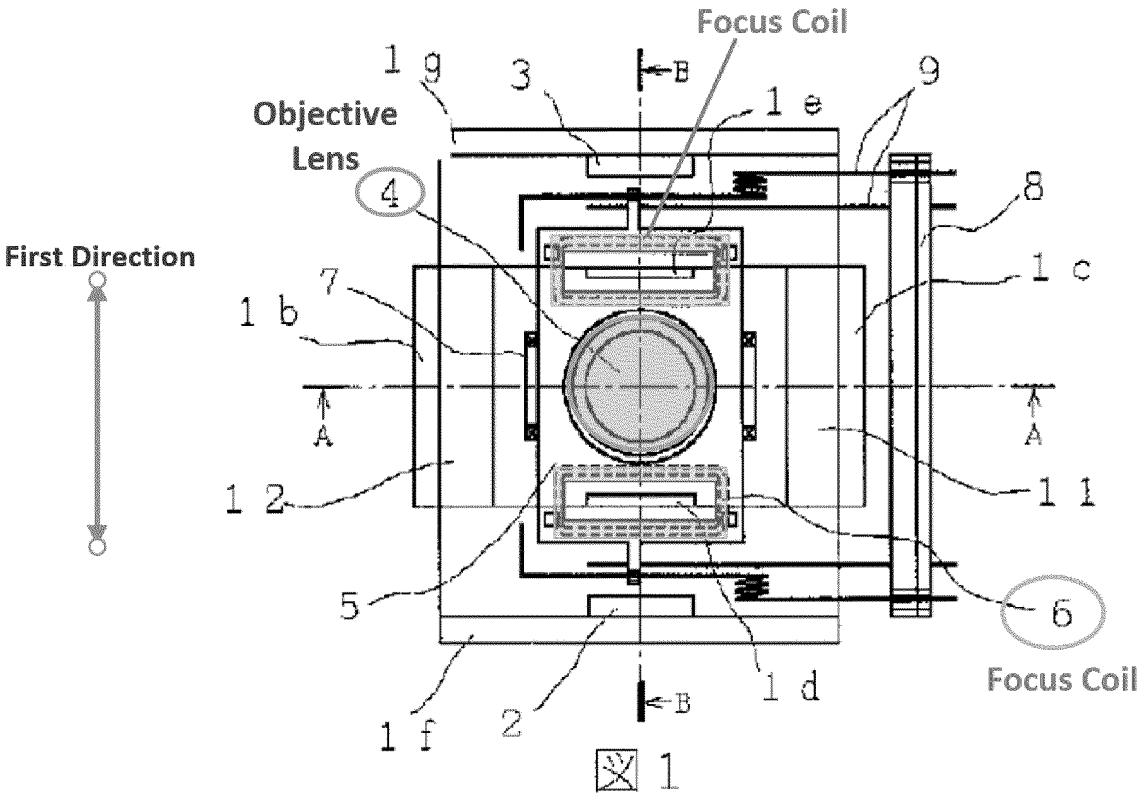


Figure 1 of Sugiyama (annotated)

2. Claim 3

Sugiyama discloses the second coil as tracking coils (7) positioned vertically along the sides of the blade, as shown in Sugiyama's Figure 1 (annotated below). *See also*, Sugiyama, 192-193.

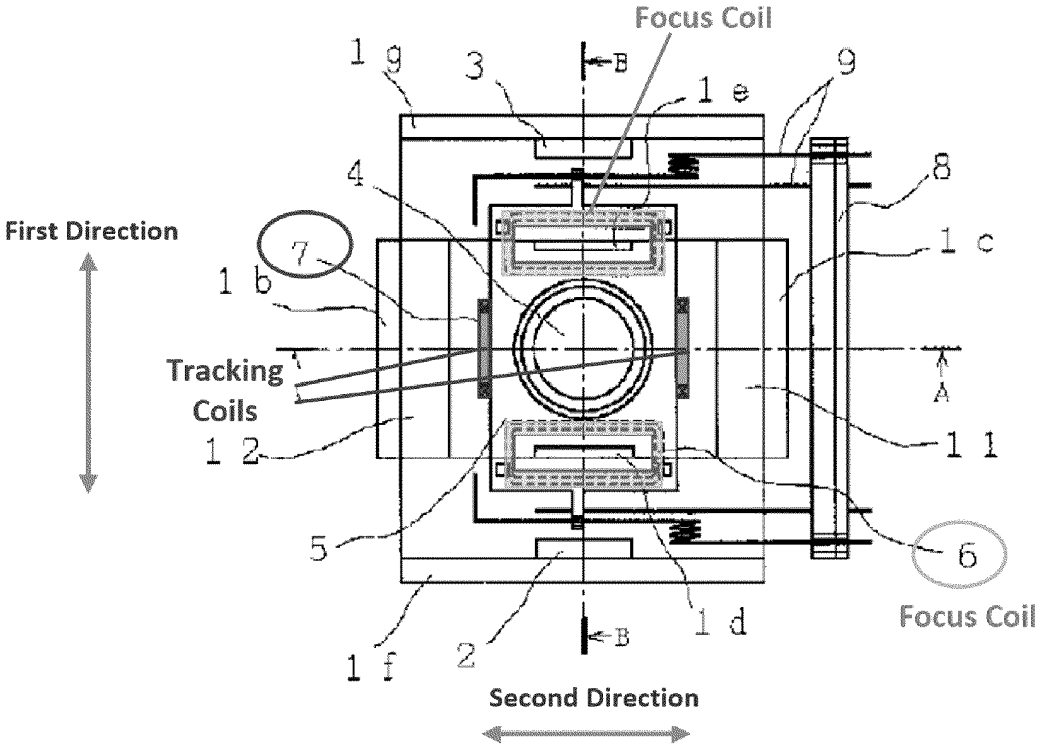


Figure 1 of Sugiyama (annotated)

Figure 2 (annotated below) illustrates tracking coils (7), positioned vertically on lens holder (5) (blade), facing magnetic elements (11, 12), and generating a force to effectuate tracking. Sugiyama, 30-35, 192-193, 201-205, 311; Fig. 2.

Thus, Sugiyama teaches or suggests that tracking coils (7) generate an electromagnetic force in a tracking direction through interaction with magnetic Element (11, 12). Mansuripur, ¶¶256-259.

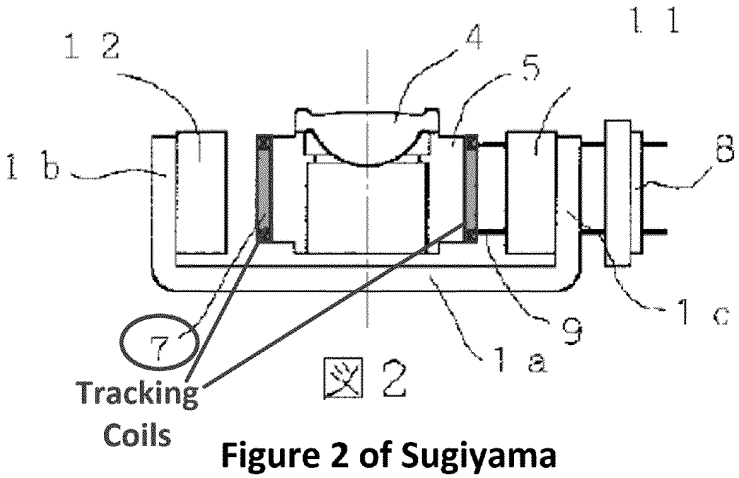


Figure 2 of Sugiyama (annotated)

3. Claim 4

Sugiyama discloses this claim because tracking coils (7) are positioned on both sides of the blade, as illustrated in Figures 1 and 2 (annotated above). Mansuripur, ¶260.

4. Claim 10

a. 10[pre]

Sugiyama teaches or suggests the preamble because it describes "an objective lens drive apparatus that keeps the relative angle between an objective lens and an optical disc constant at all times, and enables stable writing to and reading from an optical disc." Sugiyama, Abstract. An optical disc is a recording medium. Mansuripur, ¶261.

b. 10[a]

Sugiyama teaches or suggests this limitation by describing an objective lens driving device for writing/reading information to/from an optical disc. Sugiyama,

Abstract. A POSITA would have known and found it obvious that optical disc drives included a spindle motor to rotate the disc. Furthermore, a spindle motor in an optical disc drive is AAPA. Ex. 1001, 1:23-27, 3:3-8; Mansuripur, ¶262.

c. 10[b]

Sugiyama teaches or suggests this limitation by describing an objective lens drive apparatus for use in an optical disc device (Sugiyama, Abstract, 64-65) where "the light beam can be narrowed down by increasing the NA of the objective lens 4." *Id.*, 109-112; see also Ex. 1001, 6:6-11 having a similar description. Additionally, an optical pickup focusing light through an objective onto the disc for recording/reproducing information was well-known in the art and was AAPA. *Id.*, 1:20-31; Mansuripur, ¶263.

d. 10[c]

See Element 1[pre], *supra*, describing Sugiyama's optical pickup actuator accommodating an objective lens. Sugiyama further renders this limitation obvious because its pickup actuator controls the objective lens's position by moving it in tracking, focusing and tilt directions via the force generated by the respective coils. Sugiyama, 154-158, 190-200. Sugiyama also describes "an objective lens that concentrates an optical beam on an optical disc." *Id.*, 148-149; *see also*, *id.*, 142-145; Mansuripur, ¶264.

e. 10[d]-10[i]

See Element 1[a]-1[f], respectively, in Ground 10.

5. Claim 12

See Claim 3, *supra*.

6. Claim 13

See Claim 4, *supra*.

K. Ground 11: Sugiyama Alone or in View of AAPA, Combined with Kabasawa Renders Obvious Claims 5-6 and 14.

1. Claims 5/6/14: "…further comprising an inner yoke positioned on the base and positioned within a cavity defined by walls of the first coil, wherein the inner yoke has a pair of first walls disposed opposite the second coil and separated from each other in the second direction."

As explained in Ground 8, Kabasawa's optical pickup apparatus includes an objective lens (4), a focus coil (7a, b), tracking coils (8a-8d), yokes (13,14), permanent magnets (15), and an inner yoke (14) inside a cavity defined by focus coil (7a,b) (first coils). Kabasawa, Abstract, Table on p. 3, ¶¶43-44, 49, Fig. 1 (annotated below).

Kabasawa's yoke (14) has a pair of first walls (highlighted in green) opposite the tracking coils (second coil) and separated from each other in the second direction. *See* discussion in Ground 8, Element 17[e].

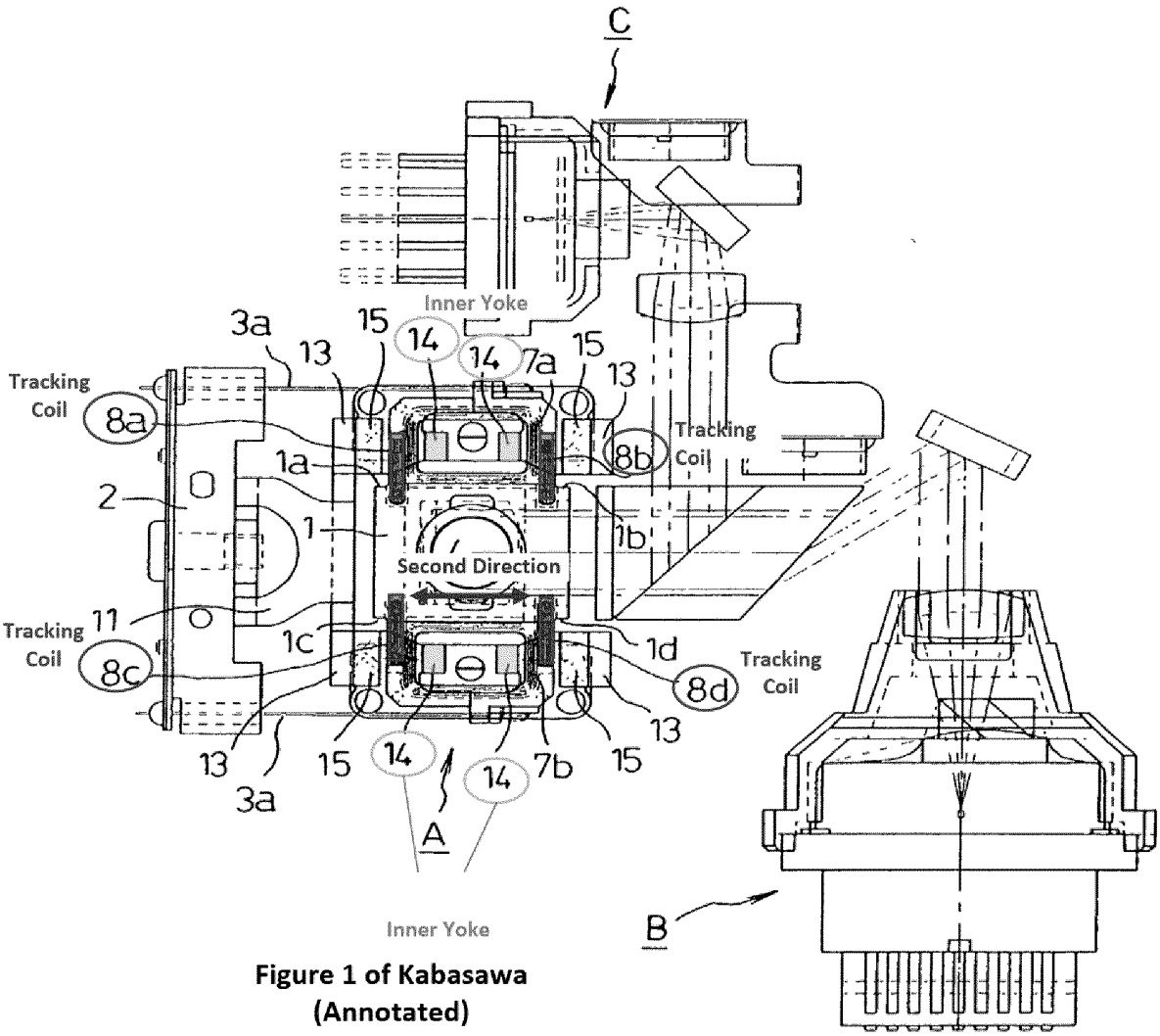


Figure 1 of Kabasawa (Annotated)

An alternate interpretation of the pair of walls is also shown in red in the figure below. *See* discussion in Ground 8, Element 17[e]. Mansuripur, ¶¶173-276.

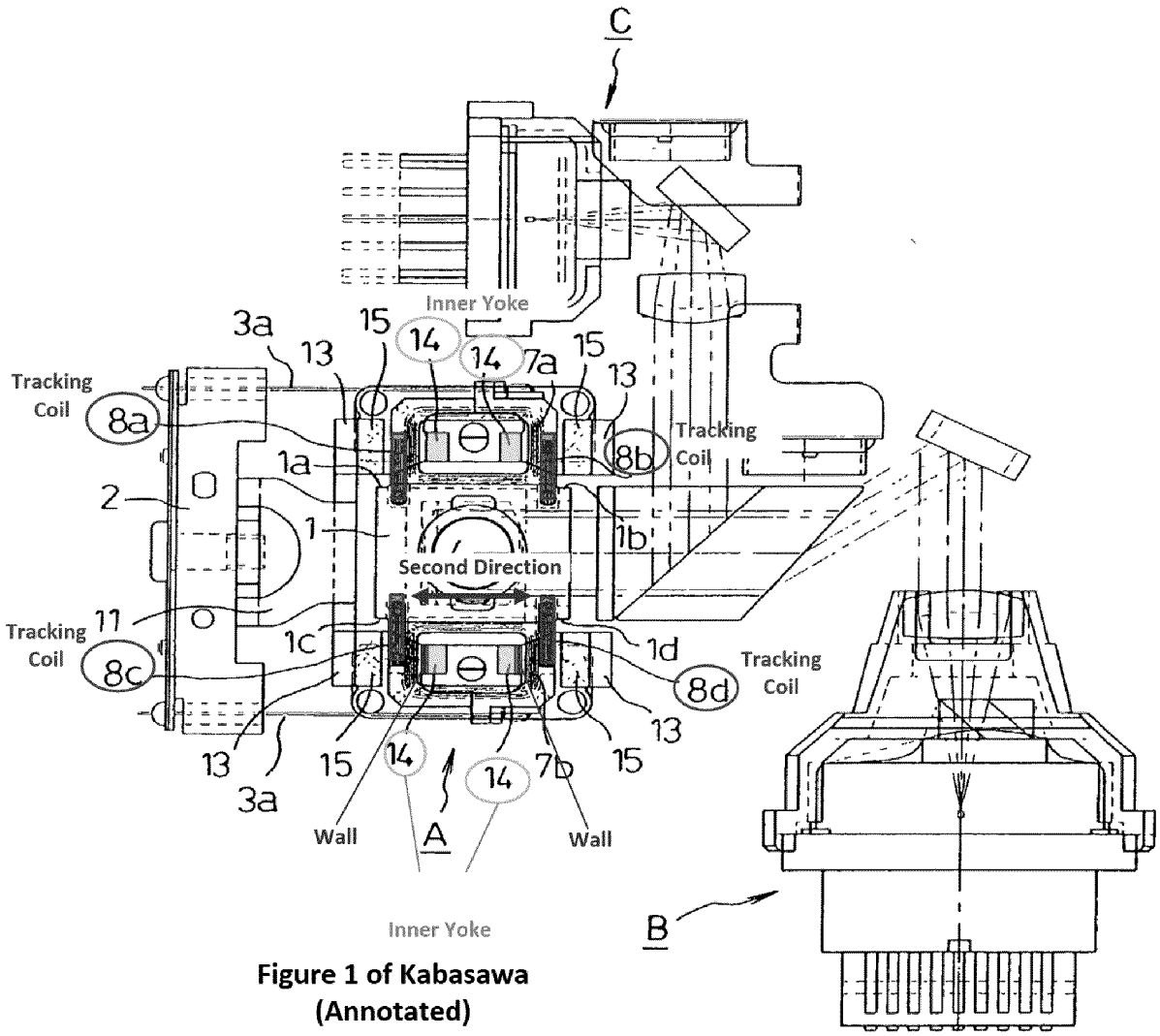


Figure 1 of Kabasawa (Annotated)

As shown in Ground 10, Sugiyama renders base claims 3, 4 and 12 obvious, and discloses tracking coils (7) that interact with magnets (11, 12). Sugiyama, ¶28; Fig. 1 (annotated below).

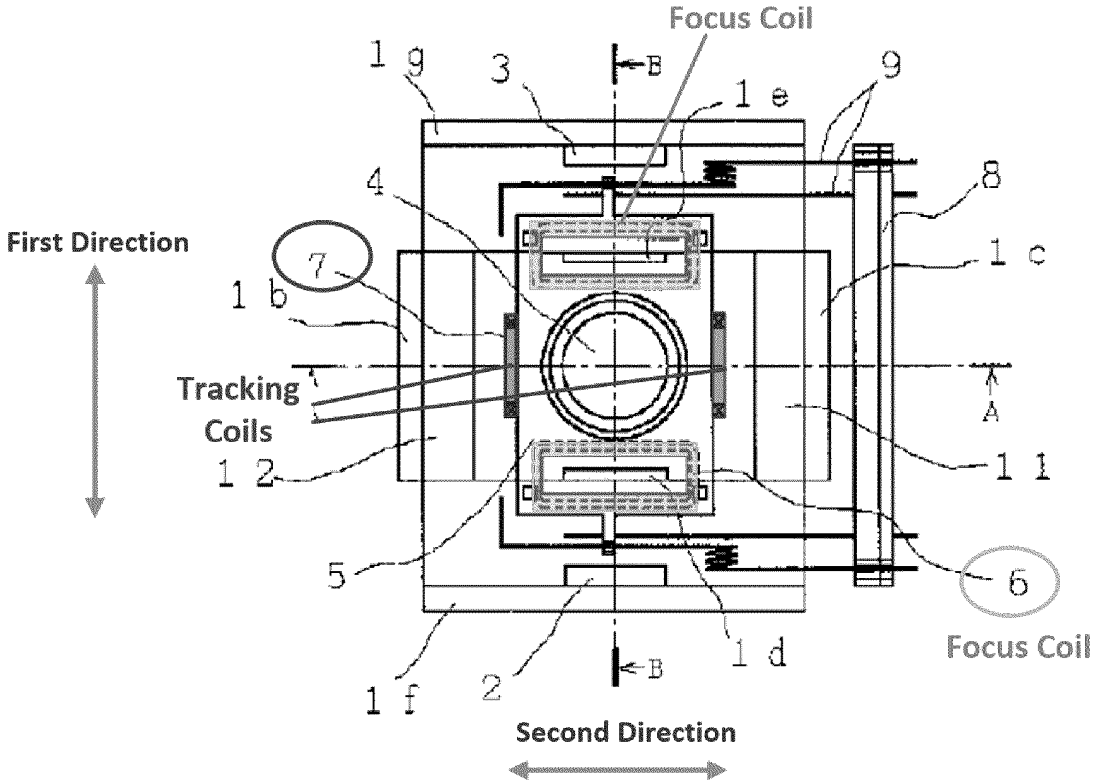
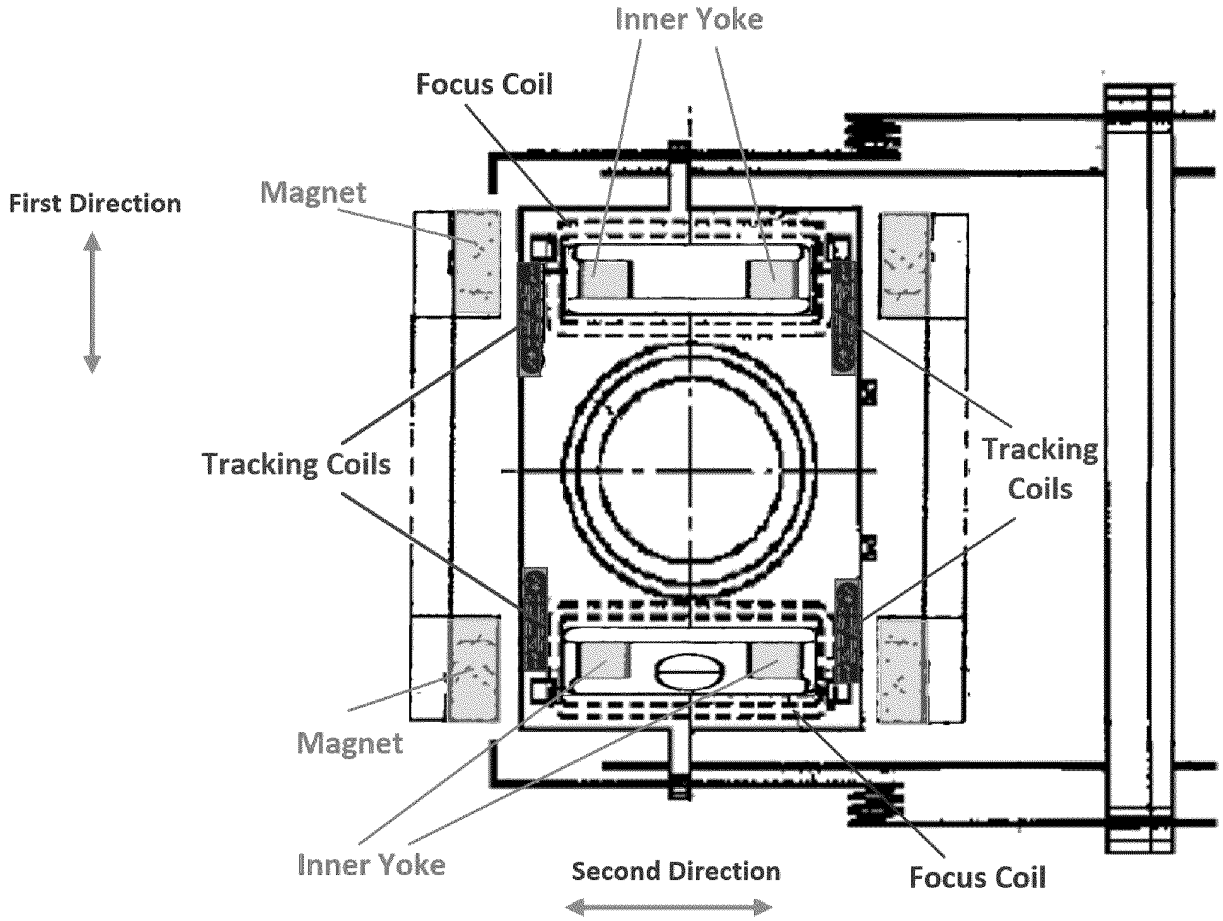


Figure 1 of Sugiyama (annotated)

Sugiyama-Kabasawa Combination: A POSITA would have replaced Sugiyama's tracking coils (7) and associated magnets (11, 12) with four tracking coils (8a-8d) and associated magnets (15) of Kabasawa; the combination would also have included inner yoke (14) of Kabasawa, as illustrated below. Mansuripur, ¶¶277-278.



Modification of Sugiyama with Kabasawa

The combination's inner yoke would be positioned on the base and within the cavity defined by walls of the first coil (i.e., Sugiyama's focus coil (6)); the inner yoke would have a pair of first walls (i.e., the two green yoke components within each focus coil cavity, or two walls of the green component in the alternate mapping). Further, the pair of first walls would be disposed opposite the second coil (tracking coils) and separated from each other in the second direction, as

shown in the above rendering. Mansuripur, ¶279; *see also* Ground 8, Element 17[e].

A POSITA would have found this combination obvious because Sugiyama and Kabasawa both describe an optical pickup in an optical disc drive with focus and tracking coils, and therefore a POSITA would have understood that their complementary and related teachings could be combined.

Furthermore, the use of multiple tracking coils and an inner yoke that improved the magnetic field's uniformity was known in the art and was described in Kabasawa and elsewhere. *See, e.g.*, Kamata in Ground 7. Therefore, using Kabasawa's tracking coil and inner yoke was one alternative to what Sugiyama described, and a POSITA would have found this combination obvious to try.

Additionally, a POSITA would have found it advantageous to include four tracking coils (instead of Sugiyama's two) to provide better and more accurate tracking control because each tracking coil could be energized separately to effectuate a more precise and controlled movement of the actuator, with stabilized weight balance and low structural resonance. Kabasawa, Abstract; ¶53.

Further, by providing four tracking coils displaced from the center of the focusing coils that interacted with a corresponding inner yoke within the cavity, the tracking coils would receive the effect of the magnetic field only at one side, thereby improving the tracking operation.

The combination with Kabasawa would have also simplified the design because Sugiyama's magnets (2, 3) would not be needed. The four magnets (annotated in green in above figure) exerted forces on both focusing coils (6), both tilt coils (13), and all four tracking coils. By choosing the orientations of the north and south poles of the four magnets, the desired forces would be exerted on all coils. This is because the directions of electric currents in each of the four tracking coils (purple) could be controlled independently from those in the focus and tilt coils, and also independently from the directions of currents in other tracking coils. Selection of the direction of the currents and polarity of the magnets would have all been obvious and known to a POSITA, and amounted to a small set of selectable values.

Additionally, the combination involves basic mechanical and electrical modifications, well within the capabilities of a POSITA, with a reasonable expectation of success. *See also*, Mansuripur, ¶¶280-287.

VI. DISCRETIONARY DENIAL IS NOT WARRANTED

A. §314(a) and *Fintiv* Factors

Factor 1: Potential for Stay: Petitioner intends to move for a stay if IPR is instituted. This factor is neutral because the Board need not speculate as to the likelihood of the court or special master entering a stay after institution. *See Western Digital v. Kuster*, IPR2020-01391, Paper 10 at 9 (Feb. 16, 2021).

Factor 2: Trial Date: The litigation trial date is currently set for August 24, 2026, which is more than a year away. A final written decision would issue within months of that date. Even "an early trial date" is "non-dispositive" and simply means "the decision whether to institute will likely implicate other factors," which, here, weigh against denial. *Fintiv*, Paper 11 at 5, 9. In view of Petitioner's *Sotera* stipulation, any prior art raised or reasonably could have been raised in this IPR proceeding will not be tried in district court even if the present trial date sticks. Notably, the Board has recently instituted IPRs based on narrower stipulations even for a Petition filed closer to the trial date. *See, e.g., Samsung Display v. Pictiva Displays*, IPR2024-01222, Paper 12 at 6-9 (Mar. 6, 2025) (instituting IPR where final written decision was due seven months after trial date). Median time-to-trial in the relevant district is 28.4 months. Ex. 1018.

Factor 3: Limited Investment in District Court Litigation: This factor strongly favors institution because the district court litigation is in its infancy. The Court just entered a scheduling order on February 25, 2025, Patent Owner just served its infringement contentions on March 28, 2025, and Petitioner has not served its invalidity contentions. *Samsung*, IPR2024-01222, Paper 12 at 7 (reasoning factor 3 favored institution even where petition filed five months after infringement contentions). Moreover, Petitioner has diligently prepared and filed this Petition more than six months before the one-year deadline. *See id.*

Factor 4: Issue Overlap: Petitioner stipulates that, if trial is instituted, Petitioner will not pursue invalidity in the litigation on any ground raised or that could have been reasonably raised in this Petition. The Board has found this type of broad stipulation "addresses concerns of duplicative efforts and potentially conflicting decisions [and] ensures that an *inter partes* review is a 'true alternative' to the district court proceeding." *Sotera*, IPR2020-01019, Paper 12 at 19 (Dec. 1, 2020) (precedential); *see also Samsung*, IPR2024-01222, Paper 12 at 7 (factor 4 favored institution in view of petitioner's *Sand Revolution* stipulation).

Factor 5: Party Overlap: Although the parties are the same, this factor is neutral given the minimal issue overlap (Factor 4). *See Apple v. Maxell*, No. IPR2020-00204, Paper 21 at 6-7 (Dec. 15, 2020).

Factor 6: Additional Factors Favor Institution: The strength of Petitioner's challenges on the merits further weighs in favor of institution. *See Fintiv*, Paper 11 at 14–15.

In sum, taking a "holistic view," the *Fintiv* factors favors institution.

B. §325(d)

None of the Petition's prior art was cited or considered during the original examination. Further, this Petition is neither cumulative, nor provides overlapping arguments with those in the original examination, because the Petition's grounds show all limitations of challenged claims are obvious. Additionally, this Petition is

accompanied by the expert testimony of Prof. Mansuripur, which the Office lacked during the prosecution.

VII. CONCLUSION

Petitioner requests institution of an IPR and cancellation of the challenged claims.

Dated: March 31, 2025

Respectfully submitted,

/Babak Tehranchi/

PERKINS COIE LLP
11452 El Camino Real, Suite 300
San Diego, CA 92130
Telephone: (858) 720-5700
Fax: (858) 720-5834

Lead Counsel
Babak Tehranchi, Reg. No. 55,937

Back-up Counsel
Patrick J. McKeever, Reg. No. 66,019
Christina J. McCullough, Reg No. 58,720

Attorneys for Petitioner

CLAIMS APPENDIX

CLAIM 1	
1[pre]	An optical pickup actuator for use with an objective lens on a base, comprising:
1[a]	a blade holding the objective lens;
1[b]	a plurality of suspension wires supporting the blade on the base so that the blade is elastically movable;
1[c]	a magnetic element positioned on the base;
1[d]	a coil positioned horizontally on the blade to generate an electromagnetic force in a focusing and/or tilting direction through an interaction with the magnetic element;
1[e]	wherein the coil is divided into a plurality of subcoils, where each subcoil is separated from an adjacent subcoil in a vertical direction, and;
1[f]	wherein the coil comprises a pair of first coils positioned on the blade in a first direction and facing each other with respect to the objective lens.
CLAIM 2	
2	The optical pickup actuator according to claim 1, wherein the coil comprises a coil surrounding an outer surface of the blade.

CLAIM 3	
3	The optical pickup actuator according to claim 1, further comprising a second coil positioned vertically on a side of the blade in a second direction substantially perpendicular to the first direction, the second coil generating an electromagnetic force in a tracking direction through interaction with the magnetic element.
CLAIM 4	
4	The optical pickup actuator according to claim 3, wherein the second coil is positioned on both sides of the blade.
CLAIM 5	
5	The optical pickup actuator according to claim 3, further comprising an inner yoke positioned on the base and positioned within a cavity defined by walls of the first coil, wherein the inner yoke has a pair of first walls disposed opposite the second coil and separated from each other in the second direction.
CLAIM 6	
6	The optical pickup actuator according claim 4, further comprising an inner yoke positioned on the base and positioned within a cavity defined by walls of the first coil, wherein the inner yoke has a pair of first

	walls disposed opposite the second coil and separated from each other in the second direction.
CLAIM 7	
7	The optical pickup actuator according to claim 1, wherein the magnetic element comprises a pair of unipolar magnets disposed opposite each other with respect to the blade and have the same polarity.
CLAIM 8	
8	The optical pickup actuator according to claim 3, wherein the magnetic element comprises a pair of unipolar magnets disposed opposite each other with respect to the blade in the second direction and have the same polarity.
CLAIM 10	
10[pre]	An optical disc drive for a disc that is a recording medium, comprising:
10[a]	a spindle motor for rotating the disc;
10[b]	an optical pickup for recording and/or reproducing information by emitting light onto the disc through an objective lens;
10[c]	an optical pickup actuator for controlling a position of the objective lens so that the emitted light is focused on a desired position of the disc, the optical pickup actuator comprising:

10[d]	a blade holding the objective lens,
10[e]	a plurality of suspension wires supporting the blade on a base so that the blade is elastically movable,
10[f]	a magnetic element positioned on the base, and,
10[g]	a coil positioned horizontally on the blade to generate an electromagnetic force in a focusing direction and/or a tilting direction through interaction with the magnetic element,
10[h]	wherein the coil is divided into a plurality of subcoils, where each subcoil is separated from an adjacent subcoil in a vertical direction, and
10[i]	wherein the coil comprises a pair of first coils positioned on the blade in a first direction so as to face each other with respect to the objective lens.
CLAIM 11	
11	The optical disc drive according to claim 10, wherein the coil comprises a coil positioned on the blade so as to surround an outer surface of the blade.
CLAIM 12	
12	The optical disc drive according to claim 10, wherein the optical pickup actuator further comprises a second coil positioned vertically on

	a side of the blade in a second direction substantially perpendicular to the first direction, the second coil generating an electromagnetic force in a tracking direction through interaction with the magnetic element.
CLAIM 13	
13	The optical disc drive according to claim 12, wherein the second coil is positioned on both sides of the blade.
CLAIM 14	
14	The optical disc drive according to claim 12, wherein the optical pickup actuator further comprises an inner yoke positioned on the base and placed inside the first coil, and wherein the inner yoke has a pair of first walls disposed opposite the second coil and separated from each other in the second direction.
CLAIM 15	
15	The optical disc drive according to claim 12, wherein the magnetic element comprises a pair of unipolar magnets disposed opposite each other with respect to the blade in the second direction and have the same polarity.

CLAIM 17	
17[pre]	An optical pickup actuator for use with an objective lens on a base, comprising:
17[a]	a blade holding the objective lens;
17[b]	a plurality of suspension wires supporting the blade on the base so that the blade is elastically movable;
17[c]	a pair of first coils positioned horizontally on the blade and disposed opposite each other with respect to the objective lens in a first direction;
17[d]	a second coil positioned vertically on a side of the blade in a second direction perpendicular to the first direction; and
17[e]	an inner yoke positioned on the base, the inner yoke positioned inside a cavity defined by each of the first coils, wherein the inner yoke has a pair of first walls disposed opposite the second coil and separated from each other in the second direction.
CLAIM 19	
19	The optical pickup actuator according to claim 17, further comprising a third coil positioned so as to surround the sides of the blade.

CLAIM 21	
21	The optical pickup actuator according to claim 17, further comprising a pair of unipolar magnets disposed opposite each other with respect to the blade in the second direction and have the same polarity.
CLAIM 23	
23	The optical pickup actuator according to claim 17, wherein the second coil is positioned vertically on both sides of the blade in the second [direction].
CLAIM 24	
24[pre]	An optical disc drive for a disc that is a recording medium, comprising:
24[a]	a spindle motor for rotating the disc;
24[b]	an optical pickup for recording and/or reproducing information by emitting light focuses onto the disc through an objective lens; and;
24[c]	an optical pickup actuator for controlling a position of the objective lens so that the emitted light is focused on a desired position of the disc, the optical pickup actuator comprising:
24[d]	a blade holding the objective lens and supported on a base by a plurality of suspension wires so that the blade is elastically movable,

24[e]	a pair of first coils positioned horizontally on the blade and disposed opposite each other with respect to the objective lens in a first direction,
24[f]	a second coil positioned vertically on a side of the blade in a second direction perpendicular to the first direction, and
24[g]	an inner yoke positioned on the base, the inner yoke positioned inside a cavity formed by walls of each of the first coils, wherein the inner yoke has a pair of first walls disposed opposite the second coil and separated from each other in the second direction.
CLAIM 26	
26	The optical pickup drive according to claim 24, wherein the optical pickup actuator further comprises a third coil positioned so as to surround the sides of the blade.
CLAIM 28	
28	The optical disc drive according to claim 24, wherein the optical pickup actuator further comprises a pair of unipolar magnets disposed opposite to each other with respect to the blade in the second direction and have the same polarity.

CLAIM 36	
36[pre]	An optical pickup actuator for use with an objective lens on a base, comprising:
36[a]	a blade holding the objective lens:
36[b]	a plurality of suspension wires movingly supporting the blade on the base;
36[c]	a pair of unipolar magnets positioned on the base; and;
36[d]	a plurality of coils positioned on the blade and interacting with the unipolar magnets to create an electromagnet force to move the blade; and;
36[e]	an inner yoke positioned inside a cavity defined by the walls of a coil, wherein the yoke comprises three sections with each of the three sections of the yoke being parallel to a different wall of the cavity to increase an effective area facing the magnets.
CLAIM 37	
37	The optical pickup actuator according to claim 36, wherein one of the coils is divided into a plurality of subcoils that are separated from one another.

CLAIM 38	
38	The optical pickup actuator according to claim 36, wherein one of the coils is positioned to surround the sides of the blade.
CLAIM 40	
40[pre]	An optical pickup actuator for use with an objective lens on a base, comprising:
40[a]	a blade holding the objective lens;
40[b]	a plurality of suspension wires movingly supporting the blade on the base;
40[c]	a plurality of hinges each of [sic] coupled to an end of a suspension wire;
40[d]	a pair of unipolar magnets positioned on the base; and
40[e]	a plurality of coils connected to an electric circuit and interacting with the unipolar magnets to create an electromagnet force to move the blade; and
40[f]	wherein at least one of the plurality of coils is divided into subcoils and a hinge coupled to each of the plurality of suspension wires is between an adjacent pair of subcoils.

CLAIM 41	
41	The optical pickup actuator according to claim 40, wherein the plurality of suspension wires are at least six suspension wires and the coil is divided into three or more subcoils.
CLAIM 42	
42	The optical pickup actuator according to claim 40, wherein a first hinge and a second hinge are positioned on each of a top and a bottom of one of the coils, respectively, and a third hinge is positioned between two of the subcoils.
CLAIM 43	
43	The optical pickup actuator according to claim 40, wherein the coils are focus and tracking coils and the electric circuit supplies current to the coils in the same direction.
CLAIM 44	
44	The optical pickup actuator according to claim 40, wherein the coils are focus and tracking coils, of which the focus coil also serves as a tilt coil and the electric circuit supplies current separately to each of the coils.

CLAIM 45	
45	The optical pickup actuator according to claim 40, wherein the coils are focus, tracking, and tilt coils and the circuit supplies current to the coils in opposite directions.

CERTIFICATION OF WORD COUNT UNDER 37 C.F.R. § 42.24(d)

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for the foregoing *Petition for Inter Partes Review* of U.S. Patent No. 7,266,055 totals 13,996, excluding the parts exempted by 37 C.F.R. § 42.24(a). Accordingly, this Petition is under the word count limit of 14,000 words.

This word count was calculated by using the built-in word-count tool in Microsoft Word 2016, the software used to prepare the document.

Dated: March 31, 2025

Respectfully submitted,

/Babak Tehranchi/

PERKINS COIE LLP
11452 El Camino Real, Suite 300
San Diego, CA 92130
Telephone: (858) 720-5700
Fax: (858) 720-5834

Lead Counsel
Babak Tehranchi, Reg. No. 55,937

Back-up Counsel
Patrick J. McKeever, Reg. No. 66,019
Christina J. McCullough, Reg No. 58,720

Attorneys for Petitioners

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true copy of the foregoing PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,266,055 and supporting materials (Exhibits 1001-1018 and Power of Attorney) have been served this 31st day of March 2025, by FedEx® delivery service on Patent Owner at the correspondence address for the attorney of record for the '055 patent shown in USPTO PAIR:

STAAS & HALSEY LLP
1201 NEW YORK AVENUE, N.W., SUITE 700
WASHINGTON, DC 20005

Dated: March 31, 2025

By: */Anita Chou /*
Anita Chou
Paralegal